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DYNAMICS RESEARCH CORPORATION

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OPERATION AND MAINTENANCE REQUIREMENTS OF THE ARMY REMOTELY PILOTED VEHICLE (RPV)

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Prepared For:

CALIFORNIA INSITUTE OF TECHNOLOGY
JET PROPULSION LABORATORY
4800 Oak Grove Drive, Pasadena, California 91103

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Prepared By:

DYNAMICS RESEARCH CORPORATION
60 Concord Street, Wilmington, Massachusetts 01887

PREFACE

DRC Report R-408U "Application of the HARDMAN Methodology to the Army Remotely Piloted Vehicle (RPV)", Volumes I and II, dated April 8, 1983, (Ref. 1) described the analytical methodology used to assess the manpower, personnel and training (MPT) requirements of the Army's proposed RPV system. Report R-408U reflected the MPT requirements for a number of operating scenarios based on a twelve (12) hour operating day.

This report, Final R430U, is a continuation of DRC's prior efforts and reflects iterative analyses of the MPT requirements for an RPV system configured to accommodate both a daylight television and a forward looking infrared (FLIR) mission payload subsystem (FMPS) and related support subsystems. Additionally, this analysis incorporates a 24 hour-a-day operational scenario. Therefore, the information presented herein was developed with a view towards delineating the differences (or "deltas") imposed by the new requirements resulting from FMPS/24 hour operating day functions. Readers are referred to DRC Report R-408U for reference to detailed specifics of the initial MPT requirements analysis that used a daylight television mission payload subsystem (TVMPS) operating in a 12 hour day.

The project effort was authorized under contract number 956554 with the California Institute of Technology, Jet Propulsion Laboratory (JPL). The contract monitors were Mr. Warren Apel and Mr. Joseph Gleason of the JPL. Work on the project was performed by members of the Man-Machine Systems

Department, Dynamics Research Corporation, Wilmington, Massachusetts. The contract Program Manager was Charles Vehlow. The Report Manager was John Glasier. Principal analysts and authors of the report were Robert Guptill, Paul Hunt, John Snow, Cecil Wakelin and Annemarie Walsh. Other contributors were Marjorie Bristol, Richard Mills, and Mark Scheerhoorn. The principal programming was accomplished by William Powers. Administrative support was provided by Donna Fentross, Sharon Doherty, Dianna DiGregorio, Mary Ann Kowalski, and Dori Boudreau.

The success of the project was due in large part to the cooperation of a number of government individuals and organizations who provided information and assistance but bear no responsibility for the results of the study. DRC is particularly grateful for the assistance provided by the staff of the Tactical Airborne Remotely Piloted Vehicle/ Drone System Project Manager (DRCPM-RPV) U.S. Army Aviation Research and Development Command, St. Louis Missouri; the U.S. Army Night Vision and Electro-Optics Laboratory (DELNV-SE), Fort Belvoir, Virginia; Defense-Manpower Data Center, Santa Barbara, California; Tank Automotive Command (TACOM), Ground Vehicles, Warren, Michigan; and members of the RPV development team of the Lockheed Missile and Space Company, Inc., Sunnyvale, California.

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1.1 PURPOSE

In June 1982, Dynamics Research Corporation (DRC) was placed under contract by the California Institute of Technology's Jet Propulsion Laboratory (JPL). The purpose of this initial contract was to determine the manpower, personnel and training requirements for the Army's Remotely Piloted Vehicle (RPV) system. The analytical tools used to assess the human resource requirements for this emerging weapon system included the HARDMAN methodology.[1] The HARDMAN (Hardware vs. Manpower) methodology is a subset of DRC's Front End Analysis Technology (FEAT). FEAT addresses overall logistic support requirements, and is applied to DoD weapon systems by a multi-disciplinary team of engineers, analysts and scientists. Thus, HARDMAN is an important and integral part of a larger supportability assessment capability.

As a result of the initial contract, numerous areas within the RPV system were identified as requiring clearer definition regarding human resource supportability. One of these areas included the total manpower, personnel and training (MPT) requirements for the operation and

[1] The HARDMAN methodology here refers to the integrated family of models and data base management techniques developed and tested by DRC for the U.S. Army. Please see ARI Technical Report, dated September, 1982, Estimating the Manpower, Personnel, and Training Requirements of the Army's Corps Support Weapon System Using the HARDMAN Methodology.

maintenance of the RPV system in a 24 hour-a-day scenario utilizing alternative air vehicle (AV) payloads. While many alternative payloads have been proposed for the Aquila RPV system, the forward looking infrared (FLIR) mission payload subsystem was selected by the Program Office as most suitable for supportability analysis at this time. Thus, DRC was awarded a five month contract in May, 1983 to determine the MPT requirements for the RPV system operating in an around-the-clock scenario while employing daylight television and FLIR mission payload packages.

1.2 SCOPE OF THE STUDY

The Remotely Piloted Vehicle (RPV) system is being developed to provide the Army with a target acquisition, target location and laser designation capability that will significantly enhance the effectiveness of the artillery. This RPV system will provide important assistance in reducing the operational deficiencies which exist in currently fielded and projected target acquisi' systems. Its ability to see battlefield areas at lon range or targets hidden from line-of-sight ground sensors, and to recognize and identify targets through use of its broad imaging sensors, is key to its utility.

The current Aquila RPV system configuration consists of seven ground vehicles per section. Five of the basic vehicles are the ground control station (GCS) which serves as the self contained command and control post for the RPV section, a launcher subsystem (LS), a recovery subsystem (RS), a maintenance shelter (MS), and an air vehicle handler (AVH). The five air vehicles (AV) organic to the RPV section provide real-time video imagery and target location information via a jam resistant data link. Alternative mission payload packages for the AV currently incorporate a daylight television and a forward looking infrared (FLIR) capability. Thus the RPV system will be able to perform its target acquisition missions in a wide range of weather conditions, encompassing both day and night operations.

The RPV is in the demonstration and validation phase of development. The present schedule calls for development testing (DT) II in Fiscal Year (FY) 84-85 with operational testing (OT) II to be conducted in FY 85. Regarding the FLIR mission payload, a request for proposal (RFP) will be issued to industry in November, 1983. Contract award is anticipated in early 1984. System Initial Operational Capability (IOC) is presently scheduled for March, 1989. The FLIR payload package will be provided to the RPV system as Government Furnished Equipment (GFE). Development of this equipment is under direction of the Army's Night Vision and Electro-Optics Laboratory, Fort Belvoir, Virginia.

Presently, there is no firm date set for the RPV system's Milestone II review by the Army Systems Acquisition Review Council (ASARC). The potential baseline solution for the RPV equipment design has been evaluated; however, alternative operational scenarios and support concepts are still being investigated. As a result, the DRC program analysis team has, in conjunction with the program office, explicitly defined the RPV baseline system to be examined during this study. The scope of this study involved the following considerations:

- Consider those equipments found within the RPV section. Included within that equipment is the FLIR mission payload subsystem (FMPS) package which can be used as an alternative payload package for the AV;

- Apply all six steps of the HARDMAN methodology. For a complete description of the HARDMAN methodology and the contents of each step of the analysis, see Section 2 of DRC's Report entitled "Application of the HARDMAN Methodology to the Army's Remotely Piloted Vehicle (RPV)"; dated April 8, 1983; (Ref. 1);

- Determine manpower requirements for operators and maintainers of the above equipment;

- Analyze crew, organizational and direct support levels of maintenance; and

- Make a comparison of human resource requirements for the RPV system operating under a 12 hour per day/daylight-only scenario versus the 24 hour per day/alternative payload scenario.

1.3 RESULTS

The thrust of this study concentrated on the human resource requirements of the RPV section. Important considerations involved an operational scenario which covered an entire 24 hour-a-day period, as well as the additional equipment necessary to support around-the-clock operation. This additional equipment consisted of the FMPS.

Table 1.3-1 presents the results of the study with respect to the reference and baseline systems analyzed for the RPV. (Readers are directed to the Glossary of Definitions/

Table 1.3-1. RPV System Summary

MANPOWER

Level	Tempo	Requirements		
		Section	Platoon	Army
Crew	Workload Driven			
	• O&O	18	72	1008
	• Sustained	17	68	952
	Contingency Manning			
	• 3 Shift	27	108	1512
	• 2 Outside/ 3 Inside	21	44	616
	• 3/2 Shift	20	40	560
	FQQPRI	18	72	1008
Direct Support	Baseline	-	20	280
	Reference	-	23	322

PERSONNEL

	Reference System		Baseline System	
	Sustained	3/2 Shift	Sustained	3/2 Shift
Number of MOS	23	23	21	21
Personnel Requirement*	3,325	4,361	3,216	4,305
Annual Recruit Rate	1,243	1,590	1,200	1,546

TRAINING

Annual Training Man-Days	86,550	106,923	75,507	93,870
Annual Instructor Requirements	95.9	112.0	83.1	98.4

*Includes Platoon Headquarters Personnel

Acronyms for the definition of these systems.) Additionally, the details of the RPV contingency manning alternatives are contained in Section 3. A brief description of the contingency manning alternatives follow. The short title after each description refers to how that alternative will be referenced in the report.

- o Three shifts - All RPV section workload inside the ground control station (GCS) and outside the GCS is performed in three shifts. (Short title - 3 shifts).

- o Three shifts in the GCS and 2 shifts outside the GCS - All RPV section workload within the GCS is performed in three shifts; all workload outside of the GCS is performed in two shifts. (Short title - 2 outside/3 inside).

- o Three shifts in the GCS and two shifts outside the GCS with outside workload shared between GCS and outside personnel - All RPV section workload within the GCS is performed in three shifts; all workload outside of the GCS is performed in two shifts, but with selected GCS personnel assisting/sharing the outside shifts. (Short title - 3/2 shift).

Some of the more specific results are contained in the following paragraphs, and are discussed in more detail in the appropriate sections of the report.

Mission

- o The equipment which defines the baseline RPV section is adequate to perform those target acquisition missions assigned to the RPV section operating in a 24 hour-a-day configuration.

System Analysis

- o The only major piece of equipment added to the previously examined RPV baseline system includes a FLIR mission payload package.

- o FQQPRI changes of moving corrective maintenance (CM) requirements to organizational support units transfers significant maintenance workload to that supporting unit.

Manpower

- o Manpower requirements of the RPV syste operating around-the-clock are driven more by contingency manning requirements than by workload considerations.

- o Operational manning requirement accounts for over 78% of the section workload, regardless of the scenario.

- o Optimal manning for the 24 hour-a-day scenario is three shifts in the GCS and two shifts outside the GCS with outside workload shared between GCS and outside personnel (3/2 shift). This contingency manning alternative requires 20 positions.

- Twenty positions at the section level (3/2 shift) permits 2 displacement cycles per day and 5 launches per day as a basic operations profile.

Personnel

- The reference system requires two more Military Occupational Specialties (MOS) than the baseline system (23 versus 21). These are the 26T and 45G. Both of these are found at the direct support level.

- The 13T10 MOS availability for the RPV system projects a 31% personnel shortfall (based on FY 1984 estimates).

Training

- A total of nine new or modified courses will be needed for the new and modified MOS's for the reference system. Six of these courses were modified for the baseline system and two others were deleted.

- The training of five existing maintenance MOS's must be modified to accommodate the RPV system. The new RPV enlisted MOS (13T) with the Additional Skill Identifier (ASI) P9 will result in the requirement for at least three new courses of instruction. The new Warrant Officer MOS (211B) will also require a new course of instruction.

- The requirement may exist for both a system specific organizational maintenance MOS (rather than ASI P9) and a direct support maintenance MOS. This is based on the amount of training required by the 13TP9 and the criticality of built-in-test (BIT) to perform to design specifications.

- The FQQPRI addition of the 13T40 at the section level greatly reduces RPV skill overload.

Impact

- RPV manpower requirements at IOC include MOS's already projected in Fiscal 1984 to be in short supply. Among the most critical of these are:

MOS		SHORTFALL
13T	-	31%
26B	-	24%
63J	-	24%
26L	-	19%
63W	-	19%

Tradeoffs

The tradeoff selected was an examination of the maintenance tasks associated with the FLIR mission payload subsystem (FMPS) at the direct support (DS), general support (GS), and depot maintenance levels. The tradeoff, thus, became a level of repair (LOR) analysis for the FMPS. Both a non-economic and an economic LOR analysis were conducted.

The non-economic analysis narrowed the choice to only the GS and depot levels as viable alternatives for performing actual test and repair. The restriction is based on the limitations of the present test stations to adequately test electro-optic (E-O) equipment combined with the need for a clean room atmosphere for handling and repair of E-O systems and their optics.

The economic analysis then concentrated on three alternatives:

(1) A FLIR reference system that accomplished as much repair at the GS level as possible consistent with the design. The E-O replaceable units, the optics and gyroscopes, were sent to the depot for repair.

(2) The three major FLIR assemblies being shipped to the depot for repair. GS level maintenance perfomed only fault isolation and removed the assembly needing repair.

(3) All FLIR maintenance accomplished at the GS level with depot maintenance performed for any major assemblies not repairable at GS level. FLIR subassemblies were repaired at the depot.

A DRC developed life cycle cost model was used to make the analytic comparison using those cost elements involved in a LOR decision. The results of the analysis were that alternative 3 was the least costly. Alternative 2 cost the most. Alternative 1 is therefore the recommended choice. Although alternative 1 is not the least costly, it satisfies the non-economic constraints.

1.4 FACTORS INFLUENCING STUDY RESULTS

The character of this study was influenced by a number of underlying assumptions and/or constraints. A brief summary of the most significant is provided below.

Force Structure

- RPV will represent a complete addition to the Army's force structure, i.e., RPV will not replace an existing system.

- Aggregated RPV MPT requirements are based on a total requirement for 14 RPV platoons within the active Army. Each platoon is composed of a platoon headquarters and four operational RPV sections.

System Design

- Each item of equipment selected for both the reference and the baseline system satisfied all projected RPV operational requirements specified in the Organizational and Operational (O&O) concept and other program documentation.

System Operation

- Mission profile/operational-mode information represents that obtained from RPV system documentation and from the RPV Program Office. In cases where operational information was not clearly defined, "best estimates" were made by DRC personnel and then verified with the RPV Program Office.

Manpower

- o Allowances and constraints for estimating manpower using the Army Manpower Authorization Criteria (MACRIT) process, contained in Army Regulation 570-2, were incorporated into the analysis.

- o The DRC-developed IMAGES model, (Interactive Manpower Aggregation Estimation System), was used to determine workload requirements from which system manpower requirements are calculated. Besides determining workload, the model also accommodated sensitivit analysis of workload requirements to variations in key system parameters. These parameters included system concepts, equipment and operational considerations.

Personnel

- o The DRC-developed IMPACT model (Interactive Manpower-Personnel Assessment and Correlation Technology), which computes system-specific personnel requirements, is driven by steady state manpower requirements. It was assumed that initial personnel requirements were therefore already filled.

Training

- Training associated with the operational test and evaluation of the proposed system and training associated with the initial fielding of the system (e.g., new equipment training) were not estimated.

- All established training is assumed to be adequately meeting existing system performance requirements.

1.5 CONCLUSIONS AND RECOMMENDATIONS

The RPV section, while operating in a 24 hour-a-day scenario and utilizing both TVMPS and FMPS payload packages, is optimally manned if operated with 3 shifts in the GCS and 2 shifts outside the GCS, with outside workload shared. This manning configuration requires a total of 20 personnel at the section level, bringing each section position to 81% of workload capacity. Hence, this configuration best satisfies all workload and contingency manning requirements.

Based upon the study's results and above conclusion, a number of recommendations are made. First, a manpower, personnel and training and requirements assessment of an RPV section deployed in the central launch configuration (ground control station and remote ground terminal forward and support elements such as launcher subsystem, recovery subsystem, and associated handling and maintenance equipment in the rear area) should be conducted. The initial study identified the possibility that workload associated with maintenance actions at the section level could be incorporated, or shifted, into existing direct support positions, or better performed in a rear area. This present study identified all operator and maintainer tasks associated with a 24 hour-a-day operation utilizing FMPS and TVMPS. The proposed investigation could also include a sensitivity analysis regarding the level at which operational and maintenance workload associated with this central launch concept is performed. This level of repair analysis should include depot level maintenance considerations.

Second, a detailed Training Resource Requirements Analysis (TRRA) should be performed to evaluate the training required by the 13T MOS and 13TP MOS. Having already identified the tasks and equipment necessary for the RPV MOS 13T personnel to perform their duties, a detailed TRRA would provide the interface between the task requirements of operators and maintainers and proposed simulators and training devices. A detailed TRRA, by developing the necessary courses of instruction for the RPV operators and maintainers, would greatly assist in finalizing the RPV Individual Training Plan (ITP).

Third, an assessment of the operation of the RPV section deployed in a nuclear, biological and chemical (NBC) environment should be conducted. Such an analysis would verify time to perform designated operator and maintainer tasks as well as determine the effectiveness of operating under NBC conditions. Additionally, as an integral part of the assessment, a human factors analysis of the ground control station should be performed. Operating within this controlled environment for extended periods of time would be key to the overall NBC evaluation.

SECTION 2 - SYSTEMS ANALYSIS

2.1 COLLECT AND REVIEW FLIR/24 HOUR SCENARIO INFORMATION

For two main reasons, substantial documentation regarding the RPV system's design requirements, operational scenario and workload information exists in DRC's Consolidated Data Base (CDB): (1) the RPV system is in the demonstration and validation phase of the program's acquisition cycle, hence much documentation of system-specific information has been accomplished by the program office and the prime contractor, and (2) the products and findings of DRC's previous RPV study are included in the automated audit trail. With the exception of the FLIR mission payload subsystem (FMPS), information required for this human resource requirements analysis of the RPV was an update of the previous study's CDB. In the case of the FMPS, initial system information had to be collected and reviewed by DRC analysts and subsequently integrated into the RPV CDB.

The primary documents that provided an update of DRC's original RPV CDB were the Army's Basis of Issue Plan Feeder Data (BOIPFD), (Ref. 2) the Final Qualitative and Quantitative Personnel Requirements Information (FQQPRI), (Ref. 3) and the latest Logistic Support Analysis Record (LSAR) (Ref. 4) summaries for the RPV system. Documentation from the Army's Night Vision and Electro-Optics Laboratory, the Navy's Maintenance and Material Management (3-M) system and a commercial vendor of FLIR equipment plus interviews with RPV program office subject matter experts, assisted in identifying viable FLIR information.

2.2 PERFORM SYSTEM ANALYSIS

2.2.1 System Functional Requirements Analysis

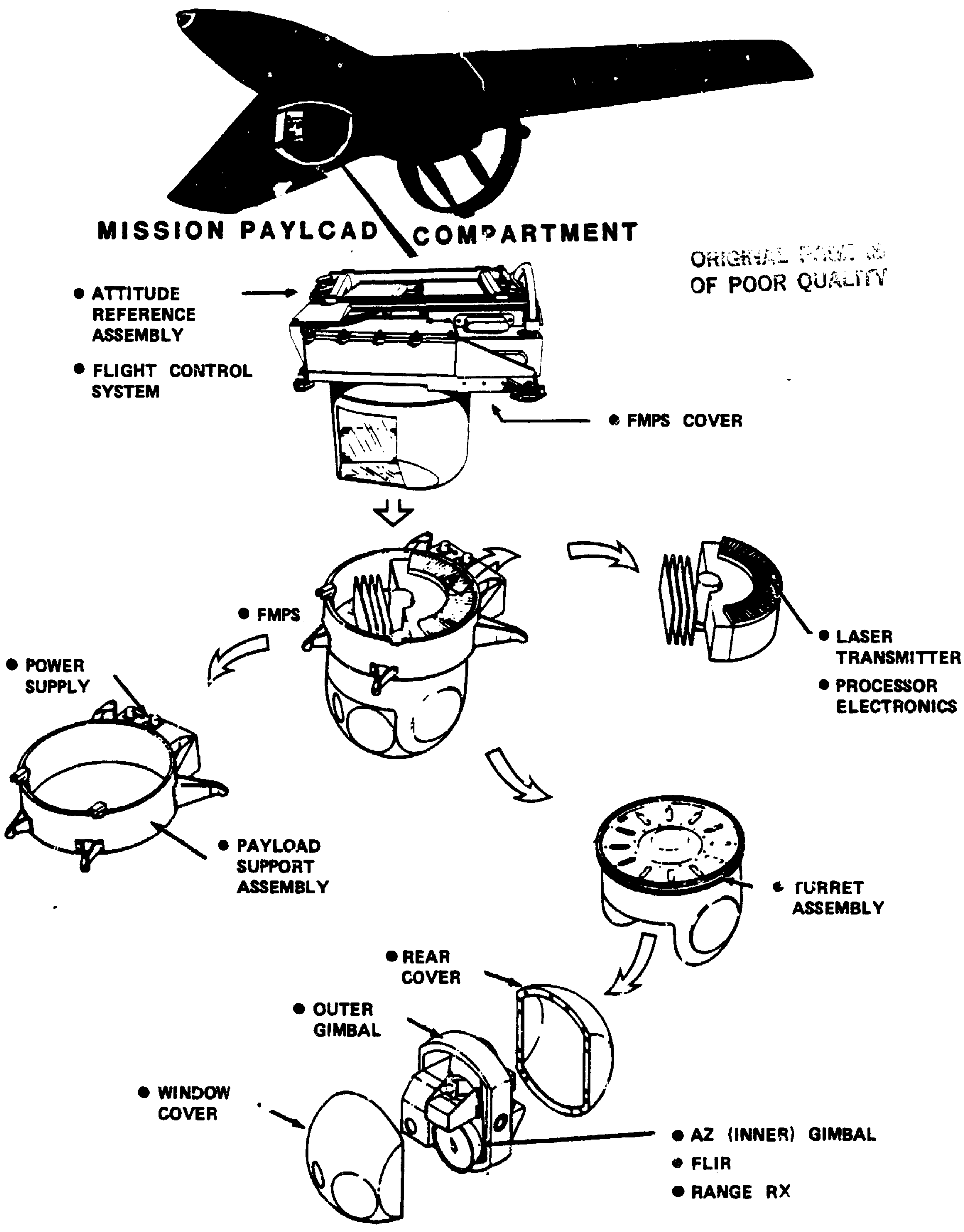
The RPV function/task listing found in Appendix A of Volume II of DRC's initial RPV report (Ref. 1) as well as the RPV task taxonomy contained in Appendix B of that report were reviewed and updated. This revision encompassed not only FLIR mission payload/24 hour scenario considerations but addressed any maintenance task changes luded in the FQQPRI documentation. Section 3.1 of report will detail the updated information regarding and failure rate data.

2.2.2 System Engineering Analysis

In order to delineate the hardware of an RPV FLIR mission payload subsystem (FMPS), an equipment description of the generic RPV FMPS at the major assembly level used in the engineering analysis is included in this section. The mission payload compartment (see Figure 2.2-1) contains the payload, one segment of the flight control system and the attitude reference assembly mounted on top of the payload. A removable access hatch is provided on the topside of the compartment (Ref. 5).

The FMPS is interchangeable with the daylight television mission payload system (TVMPS) both as to form and fit. The FMPS will use the same connections and be electrically interchangeable with the TVMPS. The controls and displays for the MPS are contained in the mission payload operator control and display (C&D) console located in the ground

Figure 2.2-1. FLIR Mission Payload Subsystem (FMPS)



FMPS MAJOR ASSEMBLIES

control station (GCS). The C&D for the alternative payload, TVMPS and FMPS, will be integrated into the same replaceable units. This is feasible since the functions and displays for the FLIR sensor (in spite of differences in functional names) are either the same or similar enough to the TV sensor. There are minor differences in the names of controls but the control positions on the control panel are essentially the same except for an additional switch function; black/white or white/black background.

The technical information collected on a generic FLIR MPS was sufficient to allow an engineering comparability analysis to be conducted for this study. In addition, as part of the engineering analysis, a thorough review of available RPV LSAR summaries, dated 13 June 1983, was performed. This review verified that no significant changes had occurred in failure rates and task data from that already developed in DRC's previous system engineering analysis efforts. Therefore, having completed the LSAR review, the consolidation of suitable FLIR reliability and maintainability (R&M) parameters was the only remaining task to complete the RPV CDB for this portion of the study.

2.2.3 RAM Data Development

To conduct an engineering comparability analysis, reliability, availability and maintainability (RAM) data is required. For this iteration, a FLIR reference system was identified in a Navy P-3 aircraft which was supported by reliability and maintainability (R&M) data resident in the Navy's 3-M maintenance data collection program. This R&M information, which served as the basic data necessary for reference system workload determination, was analyzed and failure rate data was selected for the analysis. Maintainability data was perturbed in the area of corrective and preventive maintenance task requirements for the organizational maintenance level. This assumption was based upon the fact that only organizational maintenance tasks would be required in consonance with those tasks associated with RPV TVMPS data in LSAR summaries. Comparable FLIR task times were developed from FLIR contractor estimates. These estimates are based on experience attained by current manufacturers of FLIR subsystems who have fielded a prototype FMPS and have ongoing foreign military sales programs for RPV-type payload subsystems.

For the engineering evaluation of a FLIR baseline system, DRC contacted commercial vendors of RPV FMPS packages to derive comparable FLIR R&M values. The assumption for the use of this technical data source was the fact that the RPV's FMPS was to be government furnished equipment (GFE) and, therefore, R&M data values would be closer to present RPV FLIR designs than to a new design comprised entirely of advanced technology. Additionally, this contractor had accomplished some preliminary analysis of the technical requirements of their product line in light of the prospective specifications for the y's FLIR MPS.

DRC analysts deemed these technical efforts as credible and subsequently used these R&M projections and level of repair structure as the basis for the maintenance workload determination of the FLIR baseline system. Figure 2.2-1 depicts a generic FLIR baseline design predicated on this contractor's initial engineering effort for an Army RPV FLIR subsystem. DRC's use of contractor developed data does not construe a favoring of one contractor's FLIR MPS design over any other prospective contractor's design. Rather, it is an attempt to reflect state-of-the-art in assessing technological capability for the Army's RPV FLIR subsystem.

2.3 IDENTIFY SYSTEM ANALYSIS RESULTS

Results of the FLIR system analysis showed that subsequent additions to the RPV CDB had a minimal impact on additional maintenance workload requirements for the total RPV system. The FLIR MPS maintenance requirements were minor considering the fact that: (1) no direct support maintenance would be accomplished, (2) organizational level maintenance required only minor servicing tasks for preventive maintenance and only inspection and remove and replace tasks for corrective maintenance, and (3) the designated RPV maintainer (MOS 13TP9) was capable of handling the additional workload associated with the FLIR MPS due to its similarity to TVMPS repair requirements.

SECTION 3 - DETERMINE MANPOWER RESOURCE REQUIREMENTS

3.1 STUDY CONSIDERATIONS/ASSUMPTIONS

3.1.1 Task and Failure Rate Data

Analysis of the FLIR/24 hour versus the daylight-TV/12 hour reliability, maintainability and scenario data indicated equipment failure rates and operator/maintainer tasks used to compute workload and manpower requirements were very similar. This permitted use of the existing Interactive Manpower Aggregation and Estimation System (IMAGES) data base, with modifications, to account for any changed requirements.

As noted in the engineering analysis, review of current RPV LSAR's disclosed no significant changes in failure rates for existing equipments and associated human tasks. Failure rates and tasks directly attributed to the FLIR package were therefore added to make the data base truly reflective of the FLIR/24 hour requirements. These task and failure rate additions included:

- o Inspection and service of the FLIR package at the section level;
- o Potential for reconfiguration of on-hand mission payloads and AVs to marry operational units that would satisfy mission requirements;
- o Positional MOS/skill level changes in the RPV Section.

Subsequent to the DRC daylight-TV/12 hour RPV report, "Application of the HARDMAN Methodology to the Army Remotely Piloted Vehicle" dated 8 April 1983, the Army Troop Support and Aviation Material Readiness Command (TSARCOM) published a Final Qualitative and Quantitative Personnel Requirements Information (FQQPRI) document (Ref. 3) on 27 May 1983. This document made four major changes effecting RPV section workload tasks which were incorporated into the new study.

The first two changes resulted in removal of organizational level maintenance workload within the purview of MOS 31V (Tactical Communications System Operator/Mechanic) and 63B (Light Wheeled Vehicle Mechanic) from the RPV section. The unit supporting an RPV section, the Target Acquisition Battery (TAB), was assigned responsibility for accomplishment of these maintenance tasks. Workload associated with these tasks were retained in a separate IMAGES data file and is available for determining the impact of RPV section operations of the supporting unit.

Thirdly, the FQQPRI added a requirement for MOS 52D (Power Generator Equipment Repairer) to the RPV section for operation and maintenance of the electrical power generating systems. Associated with this change is the requirement for a maximum of 90 seconds lost-power time for the ground control station (GCS). Review of the GCS power generating and distribution system equipments revealed a lack of automatic monitoring and switching controls. Therefore, to meet the 90 second power interrupt requirement, it will require both 30 KW generators to be in continuous operation (one online, one in "hot" stand-by) with an operator in constant attendance to shift load in the event the online generator fails. This operator requirement was added to the section workload tasks.

Finally, the fourth change was reflective of increased staffing requirements brought about by adding the FLIR mission payload capability and expanding the section to accommodate 24 hour operation (see Table 3.1-1). These requirements added a 13T40 position to the section and realigned task responsibilities. Task responsibilities affecting the previous daylight-TV/12 hour scenario were modified to reflect these changes and are shown in Appendix B.

3.1.2 RPV IMAGES Model.

Review of DRC's IMAGES RPV modeling equations developed for the daylight TV/12 hour scenario indicated the equations were still applicable for use with the FLIR/24 hour requirements. Equations necessary to account for multiple mission payloads and their respective maintenance requirements were added.

3.1.3 FLIR/24 Hour Scenario Changes

Addition of the FLIR package added only one new variable to the scenario factors. I is now necessary to show the ratio of specific types of mission payload flights to total RPV flights (e.g., 40% daylight TV and 60% FLIR flights).

Specific scenario changes are shown in Table 3.1-2 while composite scenario values used are listed in Appendix A. It

Table 3.1-1

RPV Section MOS, Skill Levels and Paygrades

MOS	Paygrade	Skill Level/ASI	Title
211B	WO	-	RPV Technician (Section Commander)
13T	E-7	4	RPV Section Chief
13T	E-6	3	RPV Team Leader
13T	E-5	2	Launch and Recovery Team Chief
13T	E-5	2	Senior Air Vehicle Operator
13T	E-5	2/P9	RPV Mechanic
13T	E-4	1	Senior Mission Payload Operator
13T	E-4	1/P9	RPV Mechanic
13T	E-4	1	Air Vehicle Operator
13T	E-3	1	Mission Payload Operator
13T	E-4/E-3/E-2	1	RPV Crewman
52D	E-4/E2	1	Power Generator Equipment Repairer

Table 3.1-2

FLIR/24 Hour Scenario Changes

- The section flys an average of 5 missions/day; 60% of the flights are FLIR missions; 40% are Daylight TV.

- The average FLIR/Daylight TV weather degradation factor for the sustained operation conditions is reduced to 20% from 50% (Daylight TV only). This is due to increased capability of FLIR to see through haze, smoke, darkness, and other Daylight TV degrading factors.

- Both 30KW generators will operate the entire time a section is in place with only one under load.

- Due to bad lighting conditions, all work performed outside the Maintenance and Ground Control shelters after dark has an added 10% productivity factor included in manhours required to accomplish these tasks.

- AV loss rates per flight used in the 12 hour scenario apply to the 24 hour scenario This results in a daily battle loss rate of 0.83 aircraft, and a miscellaneous loss rate of 0.33 for all other causes for five (5) flights per day in the sustained operating scenario.

- The section commander's truck will be used on-site for the equivalent of 3 round trips per day.

- All GCS flight supporting equipment operates the entire time an RPV section is inplace.

is noted that in spite of increased AV usage experienced with the FLIR/24 hour scenario, no significant increase in resupply task frequencies occurred. This is based on DRC's assumption that no inordinate delays occur in the accomplishment of resupply tasks and AV resupply will occur every 48 hours or whenever AV availability approaches 40% (two AVs). Projected total loss rates for the sustained FLIR/24 hour scenario are 1.16 AVs per day or 2.32 in 48 hours. This would alter section AV availability to an average of 53.6% before scheduled AV resupply would normally occur.

3.1.4 Contingency Manning

In the FLIR/24 hour scenario, a need arises to insure sufficient around-the-clock manning is available to support AV launch, recovery and mission flight operations for short notice or no-notice missions. This requires that the positions noted in Table 3.1-3 be continuously manned on a rotating shift basis. Although positions satisfying these operational requirements are available to perform useful work, there will be times when personnel are being used for no other purpose than to be fully ready in the event a mission may be required during the period of their shift. Therefore, this contingency operational manning could lead to some positions not being filled to workload capacity.

Table 3.1-3 RPV Section FLIR/24 Hour Operational Manning Positions

Operator Position Title	Number Per Shift
Mission Commander	1
Mission Payload Operator	1
Air Vehicle Operator	1
Launch/Recovery Team Leader	1
Launch/Recovery Team Member o AVH/LS Crane Operator o RPV Crewman o RPV Crewman o RS Operator (required due to simultaneous deployment of RS for each launch)	4
30KW Generator Operator	1

3.2 RPV WORKLOAD DEVELOPMENT

3.2.1 RPV Section Workload

DRC's IMAGES model was used to compute workload for the RPV FLIR/24 hour scenario. Scenario and task values (Appendices A and B, respectively) were revised from the 12 hour analysis case to show specific value changes applicable to the FLIR/24 hour scenario. These new sets of operational values were then used to compute the RPV section workloads as shown in Figure 3.2-1 and Table 3.2-1.

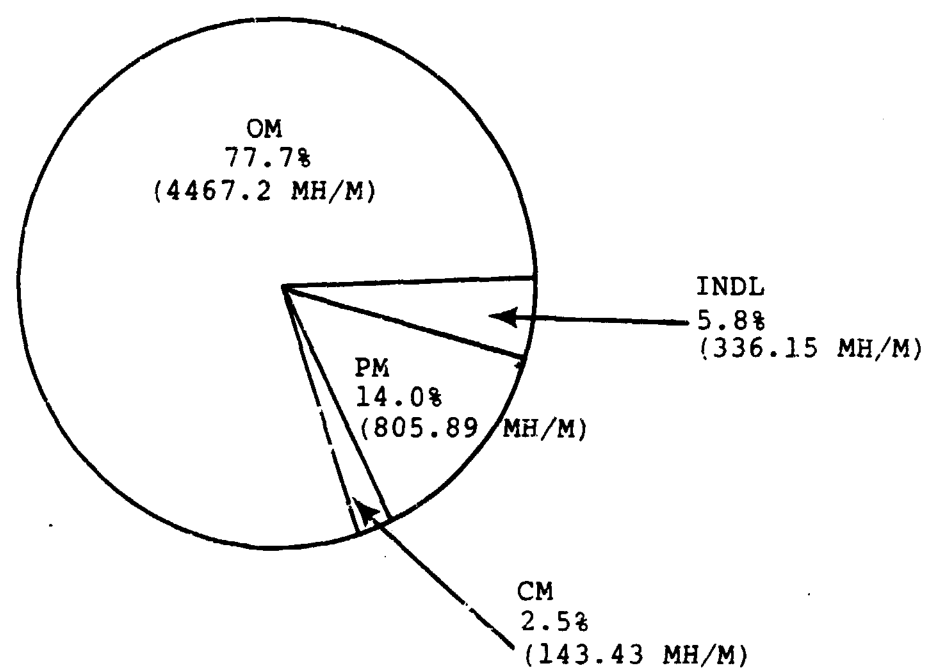
Workload was aggregated by specific MOS skill level and ASI to efficiently load the identified positions shown in the Workload Position sections of Table 3.2-2. It is noted that each position shown is loaded to no more than 90% of its 365 hours/month capacity. This loading accounts for personal productivity associated with tasks that are not bound by fixed time limits (e.g. extracting an AV after netting requires no specific length of time to complete whereas being mission payload operator for a 3 hour flight takes 3 hours and is time bound). Section maintenance workload growth in moving to the 24 hour operating period was significantly reduced by shifting workload associated with the 31V and 63B MOS out of the section and assigning its responsibility to the unit supporting the RPV section. The workload and positions associated with these support requirements are shown in Table 3.2-3.

3.2.2 RPV Section Operator Requirements

The change from 12 hour to 24 hour operations required further analysis of the operator positions identified in Table 3.1-1. For the 12 hour scenario the operator

Figure 3.2-1
RPV Section Workload Distribution

REFERENCE - O&O SCENARIO



REFERENCE - SUSTAINED

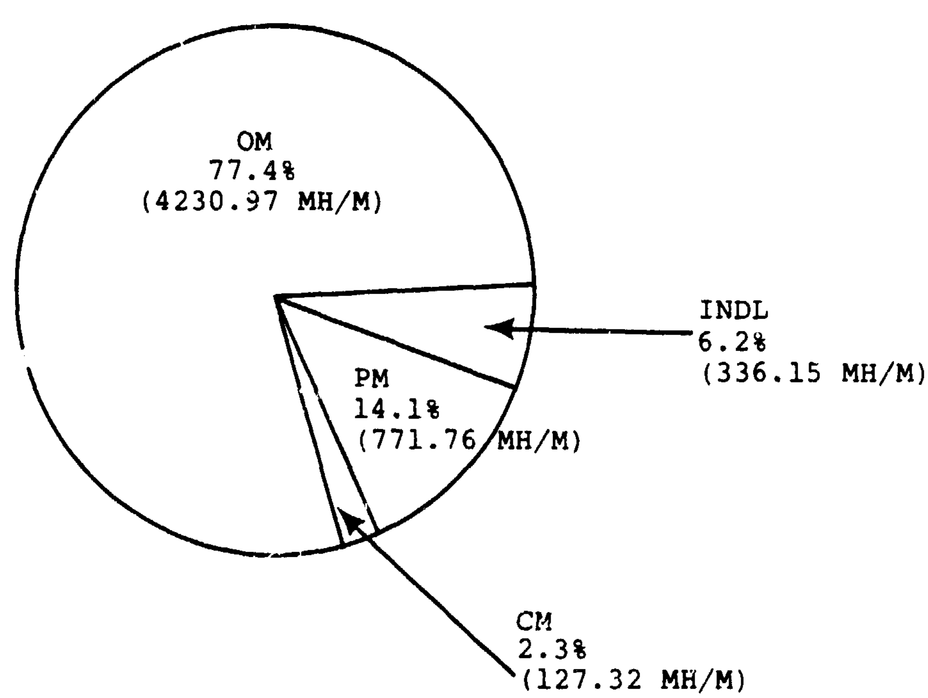
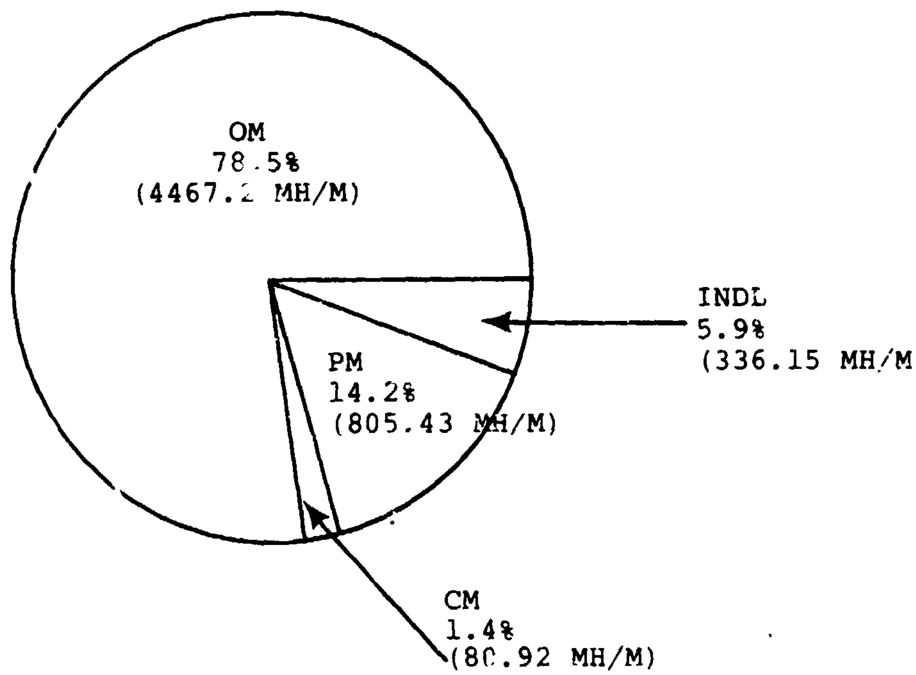


Figure 3.2-1 (Continued)

BASELINE - O&O SCENARIO



BASELINE - SUSTAINED

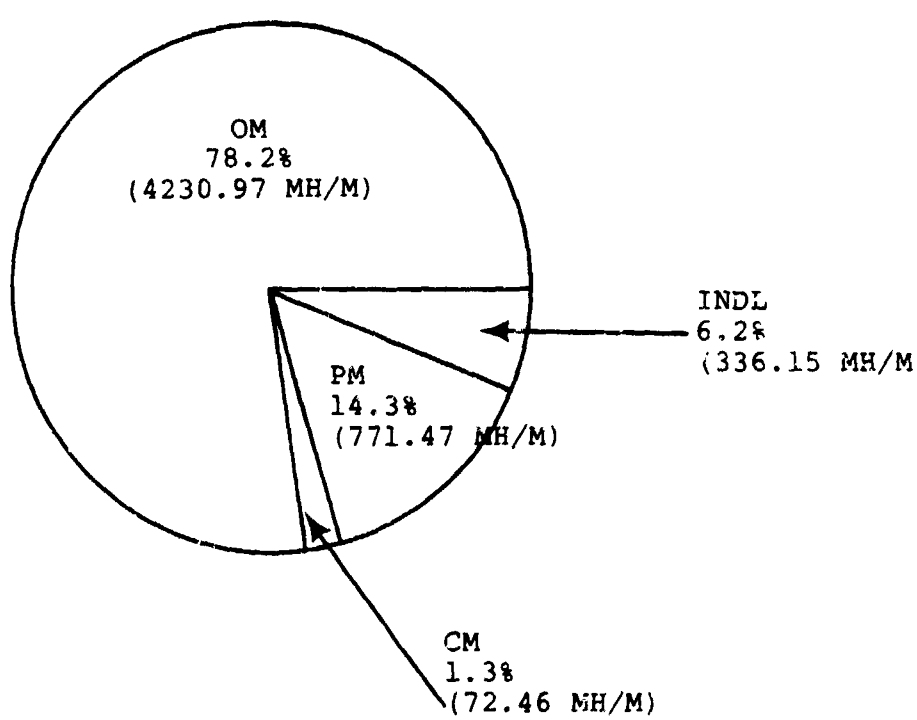


Table 3.2-1

RPV Section Workload Distribution (MH/Month)

MOS/SI/PAYGRADE		WORKLOAD CATEGORY	REFERENCE O&O	REFERENCE SUSTAINED	BASELINE O&O	BASELINE SUSTAINED
211B		OM	-	-	-	-
		PM	-	-	-	-
		CM	-	-	-	-
		INLD	42.35	42.35	42.35	42.35
13T40	E7	OM	59.90	59.90	59.90	59.90
		PM	-	-	-	-
		CM	-	-	-	-
		INDL	64.36	64.36	64.36	64.36
13T30	E6	OM	656.52	606.35	65.52	60.35
		PM	-	-	-	-
		CM	-	-	-	-
		INDL	-	-	-	-
13T20	F5	OM	34.23	24.86	34.23	24.86
		PM	2.73	2.73	2.73	2.73
		CM	0.20	0.17	0.20	0.17
		INDL	4.82	[illegible]82	4.82	4.82
13T20P9	E5	OM	-	-	-	-
		PM	33.40	33.66	32.52	25.24
		CM	39.95	26.12	19.30	15.96
		INDL	2.16	2.16	2.16	2.16
13T10	E4	OM	538.66	493.38	538.66	493.38
		PM	166.24	165.62	166.38	165.83
		CM	14.29	13.34	6.10	5.61
		INDL	2.16	2.16	2.16	2.16
13T10P9	E4	OM	47.48	47.58	47.57	47.57
		PM	136.18	123.26	136.46	123.64
		CM	67.36	60.69	38.83	35.55
		INDL	-	-	-	-
52D10	E4	OM	340.57	340.57	340.57	340.57
		PM	34.17	34.17	34.17	34.17
		CM	13.30	12.42	13.30	12.42
		INDL	-	-	-	-

Table 3.2-1 (Continued)

MOS/SI/PAYGRADE		WORKLOAD CATEGORY	REFERENCE O&O	REFERENCE SUSTAINED	BASELINE O&O	BASELINE SUSTAINED
13T10	E3	OM	105.86	968.38	1058.86	968.38
		PM	60.23	48.86	60.23	48.86
		CM	1.83	1.41	0.87	0.73
		INDL	18.79	18.79	18.79	18.79
13T10	E2	OM	152.38	145.36	152.38	145.36
		PM	38.30	36.36	38.30	36.36
		CM	6.50	5.63	2.32	2.02
		INDL	-	-	-	-
52D10	E2	OM	349.97	349.97	349.97	349.97
		PM	29.24	29.24	29.24	29.24
		CM	-	-	-	-
		INDL	-	-	-	-
XXXX	E4	OM	6.36	6.36	6.36	6.36
		PM	-	-	-	-
		CM	-	-	-	-
		INDL	-	-	-	-
XXXX	E3	OM	31.82	31.82	31.82	31.82
		PM	-	-	-	-
		CM	-	-	-	-
		INDL	-	-	-	-
XXXX	E2	OM	1190.35	1156.44	1156.44	1156.44
		PM	305.40	305.40	305.40	305.40
		CM	-	-	-	-
		INDL	201.51	201.51	201.51	201.51
TOTAL		OM	4467.20	4230.97	4467.20	4230.97
		PM	805.89	771.76	805.43	771.47
		CM	143.43	127.32	80.92	72.46
		INDL	336.15	336.15	336.15	336.15
GRAND TOTAL			5752.67	5466.20	5689.70	5411.05
MAXIMUM NUMBER OF WORKLOAD DRIVEN POSITIONS *(90% loaded to account for personal productivity)			18*	17*	18*	17*

Table 3.2-2. RPV Section Manpower Requirements Summary by Crew Position for 24 Hour - FLIR Operations.

CREW POSITION	MOS/SI ASI	PAYGRADE	WORKLOAD POSITIONS O&O	WORKLOAD POSITIONS SUSTAINED	OPERATOR POSITIONS FQQPRI[1]	THREE[1] SHIFTS (3 SHIFT)	2 SHIFT OUTSIDE 3 SHIFT GCS[1] (2 OUTSIDE/3 INSIDE)	3 SHIFT GCS[1], 2 SHIFT OUTSIDE, SHARED POSITION (3/2 SHIFT)
Mission Commander	211B0	WO	1	1	1	1	1	1
	13T40	E7	1	1	1	1	1	1
	13T30	E6	1	1	1	1	1	1
Air Vehicle Operator	13T20	E5	1	1	1	1	1	1
	13T10	E4	1	1	1	1	1	1
	13T10	E4	1	1	1	1	1	1
Mission Payload Operator	13T10	E4	1	1	1 (E5)	1	1	1 + 4 hr. L/R Team
	13T10	E3	1	1	1	1	1	1 + 4 hr. L/R Team
	13T10	E3	1	1	1	1	1	1 + 4 hr. L/R Team
Generator Operator	52D10	E4	1	1	1	1	1	1
	52D10	E2	1	1	0	1	1	1
	52D10	E2	0[2]	0[2]	0	1	0	0
Launch/ Recovery Team Leader	13T30	E6	1	1	1	1	1	1
	13T20	E5	1	1	1	1	1	1
	13T20 P9	E5	1	1	1	1	(see L/R Team)	(see L/R Team)
Launch/ Recovery Team #1	13T10 P9	E4	1	1	1	1	1	1
	13T10	E3	1	1	1	1	1	1
	13T10	E3	1	0	1	1	1	1
	13T10	E2	1	1	1	1	1	1
Launch Recovery Team #2	13T10	E4	0	0	1 (13T10 P9)	1	1 (13T20 P9)	1 (13T20 P9)
	13T10	E3	0	0	0	1	1	*GCS Operators Shared Position
	13T10	E3	0	0	0	1	1	1
	13T10	E2	0	0	0	1	1	1
Launch Recovery Team #3	13T10	E4	0	0	0	1	0	0
	13T10	E3	0	0	0	1	0	0
	13T10	E3	0	0	0	1	0	0
	13T10	E2	0	0	0	1	0	0
TOTAL			18	17	18	27	21[3]	20[3]

Table 3.2-2 (Continued)

NOTE: (1) There is no difference in operator shift position requirements between O&O and sustained scenarios as they both cover 24 hour periods.

(2) Decision not to include a third 52D position assumes the 13T10 is capable of manning the generator operation station part time with a minimum of on-the-job-training (OJT).

(3) Allows for availability of vehicle drivers to make resupply, site survey and RPV briefing trips offsite.

Table 3.2-3. Displaced RPV Organizational Workload

MOS	Workload (MMH/MO) Baseline	Workload (MMH/MO) Reference	Positions* Baseline	Positions* Reference
O&O Scenario				
31V	11.07	16.25	1	1
63B	225.63	225.63	1	1
Sustained Scenario				
31V	9.88	15.18	1	1
63B	210.30	225.29	1	1

* Workload capacity of each supporting unit organizational position is assumed to be the same as for the RPV section.

positions required only one shift; further, those positions requiring intense concentration (GCS positions) could be rotated with less intense duties of the launch/recovery (L/R) team. This operating procedure also permits sufficient positions to make resupply runs and still launch, operate and recover the AV. Permitting section members an uninterrupted 7 hour period for sleep each day was easily accommodated in the 12 hour off cycle even when resupply and relocation might have occurred in this timeframe.

The 24 hour scenario presents a completely different problem than that of the 12 hour. More specific delineation of responsibilities and accounting for rest periods and off-site briefing/resupply requirements is required. In the 24 hour scenario, the five flights proposed for each day can be assigned at any time. To be prepared for this contingency, all operator positions listed in Table 3.2-1 must be manned 24 hours a day. Workload not specifically associated with an operator position can be performed by that individual during the periods when they are in a standby mode. A key exception to this method of operation would be for workload which causes personnel to leave the site (e.g., resupply runs). In these cases, an individual not in the duty shift must be used. Table 3.2-2, Operator Positions, show three possible shift configurations to man the section for 24 hour operations.

While a detailed human factors analysis of RPV section positions was not within the scope of this study, RPV section operator positions were subjected to a qualitative human factors review for the degree of intense concentration required and the duration this attention must be applied. It was concluded that the Mission Commander (MC), Mission

Payload Operator (MPO) and Air Vehicle Operator (AVO) positions required intense concentration on cathode ray tube (CRT) displays for five hours out of every 8 hour shift period. For these types of operational conditions, the Navy, as an example, restricts the operator shift time to two-4 hour periods a day (a three shift rotation). Applying this concept to the entire RPV section results in 27 operator positions per section. This number of operators would be more than sufficient to accomplish all workload including off-site trips but represents very inefficient utilization of available workload capacity. Although GCS operator shifts were optimized with this manning configuration, an average section position is loaded to only 60% of its capacity.

All other operator positions not in the GCS were similarly analyzed and evaluated as requiring low to moderate levels of concentration for short periods of time with the exception of the 30KW generator operator. This position required low levels of concentration for extended periods. Fatigue factors were also qualitatively evaluated for non-GCS operators. It was concluded that there is no reasonably expected workload that will over fatigue a rested, healthy operator in a 12 hour shift routine. This then gave rise to the possibility of a split shift situation for RPV section operators such as shown in Table 3.2-2. This manning scheme results in 21 operators being required and is much more efficient than the simple three shift condition. Additionally, this contingency manning results in an average section position being loaded to 77% of capacity.

Continued analysis of RPV section operator requirements indicated that part of the operators in the GCS could also be used as L/R team members when not on duty in the GCS. For this reason, it is suggested that the 4 hours that each of three GCS operators has available for useful work after standing shift in the GCS be combined to satisfy one operator position in the L/R team. This reduces total operator requirement to 20 (Table 3.2-1) and still provides sufficient personnel not in the duty shift, but still available for duty, to make necessary off site trips.

A 20 man RPV section is therefore considered the optimum manpower blend to satisfy workload and operator driven requirements. This brings the average RPV section position to 81% of workload capacity. Army RPV manpower requirements resulting from these analyses are shown in Tables 3.2-4 and 3.2-5.

3.2.3 Direct Support (DS) Level Maintenance Workload

DS level workload was analyzed in a similar manner to that used for the daylight-TV/12 hour scenario. The only notable change is in the requirements for MOS 63W (Wheeled Vehicle Repairer). This change has been brought about by significantly increasing the number of launch, recovery and air vehicle handler operations. Increasing planned flights and increased launches due to reduction of weather cancellations resulted in a 267% rise in activity over the previous study. No appreciable FLIR mission payload subsystem (FMPS) workload was added at DS level because the fault isolation and corrective maintenance is to be accomplished at the GS and depot levels.

Table 3.2-4

Manpower Requirements Reference and Baseline Systems

Sustained Concept*

			RPV SECTION			RPV PLATOON			ARMY TOTAL		
MOS	ASI	PAYGRADE	WORKLOAD	3 SHIFT	3/2 SHIFT SHARED	WORKLOAD	3 SHIFT	3/2 SHIFT SHARED	WORKLOAD	3 SHIFT	3/2 SHIFT SHARED
211B0		WO	1	1	1	4	4	4	56	56	56
13T40		E7	1	1	1	4	4	4	56	56	56
13T30		E6	2	2	2	8	8	8	112	112	112
13T20		E5	2	2	2	8	8	8	112	112	112
13T10		E4	3	5	3	12	20	12	168	280	168
13T10		E3	3	8	5	12	32	20	168	448	280
13T10		E2	1	3	2	4	12	8	56	168	112
13T20P9		E5	1	1	1	4	4	4	56	56	56
13T10P9		E4	1	1	1	4	4	4	56	56	56
52D10		E4	1	1	1	4	4	4	56	56	56
52D10		E2	1 (1)	2	1 (1)	4	8	4	56	112	56
			17	27	20	68	108	80	952	1512	1120

*RPV Platoon Headquarters Requirements are not included in this table.

Note: (1) Assumes 13T10 is capable of manning the generator operator station with minimum on-the-job training (OJT).

Table 3.2-5

Manpower Requirements Reference and Baseline Systems

O&O Concept*

			RPV SECTION			RPV PLATOON			ARMY TOTAL		
MOS	ASI	PAYGRADE	WORKLOAD	3 SHIFT	3/2 SHIFT SHARED	WORKLOAD	3 SHIFT	3/2 SHIFT SHARED	WORKLOAD	3 SHIFT	3/2 SHIFT SHARED
211B0		WO	1	1	1	4	4	4	56	56	56
13T40		E7	1	1	1	4	4	4	56	56	56
13T30		E6	2	2	2	8	8	8	112	112	112
13T20		E5	2	2	2	8	8	8	168	112	112
13T10		E4	3	5	3	12	20	12	168	280	168
13T10		E3	4	8	5	16	32	20	224	448	280
13T10		E2	1	3	2	4	12	6	56	168	112
13T20P9		E5	1	1	1	4	4	4	56	56	56
13T10P9		E4	1	1	1	4	4	4	56	56	56
52D10		E4	1	1	1	4	4	4	56	56	56
52D10		E2	1 (1)	2	1 (1)	4	8	4	56	112	56
			18	27	20	72	108	80	1008	1512	1120

*RPV Platoon Headquarters Requirements are not included in this table.

Note: (1) Assumes 13T10 is capable of manning the generator operator station with minimum on-the-job-training (OJT).

DS workload and manpower requirements are shown in Tables 3.2-6 and 3.2-7.

3.3 MANPOWER ANALYSIS RESULTS

3.3.1 FLIR RPV Section

From this analysis, it can be seen that for the 24 hour scenario it is the operator shift requirements rather than workload which is the controlling factor for manpower requirements. Making maximum use of all manpower assets, including maintainers to fill operator requirements, the RPV section will need 20 positions to function properly. These personnel, when in a stand-by mode while on shift duty, would be expected to accomplish other useful section workload such as air vehicle preventive and corrective equipment maintenance. Because there are now more positions than required by absolute workload, the inclusion of additional flights and/or section displacements can be considered without impacting manpower requirements.

Each additional flight adds 15.8 manhours of workload to the section total and each displacement cycle adds 46.8 manhours. This would mean, for example, the FLIR scenario could include up to two displacement cycles per day without adding any workload positions in excess of those driven by operator requirements. This is as a result of contingency manning providing additional workload capacity. Furthermore, two moves per day would not impact upon the operational requirement to conduct five flights per day.

Table 3.2-6

Direct Support Maintenance Manpower Reference System
24 Hour - FLIR Operations

MOS	PAYGRADE	MONTHLY MANHOURS O&O	SUSTAINED	RPV PLATOON O&O	SUSTAINED	ARMY TOTAL O&O	SUSTAINED
26B	E4	10.98	10.45	1	1	14	14
26L	E5*	56.68	45.36	1	1	14	14
26T	E4	82.29	66.16	1	1	14	14
31E	E4	133.81	116.77	1	1	14	14
31J	E4	60.73	60.73	1	1	14	14
31S	E4	26.38	26.38	1	1	14	14
34Y	E5*	46.78	39.94	1	1	14	14
35E	E5*	10.76	7.57	1	1	14	14
35H	E5*	35.90	35.90	1	1	14	14
36H	E4	14.59	14.59	1	1	14	14
41B	E4	19.41	19.41	1	1	14	14
41C	E4	0.46	0.46	1	1	14	14
43M	E4	1.39	1.39	1	1	14	14
44B	E5*	20.93	19.03	1	1	14	14
45B	E4	1.38	1.38	1	1	14	14
45G	E4	105.83	74.91	1	1	14	14
52C	E5*	53.93	53.21	1	1	14	14
52D	E4	91.02	80.66	1	1	14	14
63G	E5*	189.22	156.93	1	1	14	14
63J	E4	1.34	0.95	1	1	14	14
63W	E3	416.00	416.00	2	2	28	28
63W	E5*	180.60	101.23	1	1	14	14
TOTAL		1560.41	1349.41	23	23	322	322

*Includes workload from a lower skill level within the same MOS.

Table 3.2-7

Direct Support Maintenance Manpower Baseline System
24 Hour - FLIR Operations

MOS	PAYGRADE	MONTHLY MANHOURS O&O	MONTHLY MANHOURS SUSTAINED	RPV PLATOON O&O	RPV PLATOON SUSTAINED	ARMY TOTAL O&O	ARMY TOTAL SUSTAINED
26B	E4	.90	0.72	1	1	14	14
26L	E5	.20	0.17	1	1	14	14
31E	E4	81.19	76.23	1	1	14	14
31J	E4	12.82	12.82	1	1	14	14
31S	E4	26.38	26.38	1	1	14	14
34Y	E5*	7.54	6.39	1	1	14	14
35E	E5	1.30	0.96	1	1	14	14
35H	E5*	35.90	35.90	1	1	14	14
36H	E4	14.59	14.59	1	1	14	14
41B	E4	19.41	19.41	1	1	14	14
41C	E4	0.46	0.46	1	1	14	14
43M	E4	8.32	8.32	1	1	14	14
44B	E5*	22.22	19.97	1	1	14	14
45B	E4	1.38	1.38	1	1	14	14
52C	E5*	65.69	64.97	1	1	14	14
52D	E4*	75.42	69.66	1	1	14	14
63G	E5*	72.20	62.62	1	1	14	14
63J	E4	0.96	0.68	1	1	14	14
63W	E3	208.00	208.00	1	1	14	14
63W*	E5	105.42	64.32	1	1	14	14
TOTAL		760.30	693.95	20	20	280	280

*Includes workload from a lower skill level within the same MOS.

A review of Table 3.3-1 shows the preponderance of section workload is associated with GCS operators. The second ranking workload high driver (generator operator) could be eliminated by adding an appropriate switchboard or switching capability in the power distribution design. These additions would permit parallel operation of the two 30KW generators, automatic disconnect of a failing generator, and alarm presentation in the GCS to notify operators of a generator failure.

Not shown as a high driver, but contributing two positions to the 20 man RPV section, is the imposed requirement to deploy the recovery system for each launch. If this requirement were removed and the generator operator replaced by a switchboard capability, the RPV section could potentially be reduced to 16 positions (remove one 52D10 and three 13T10s). This would coincide closely with the expected number of workload-driven positions for that situation.

The shifting of MOS 31V and 63B tasks to the supporting unit has reduced section workload by the equivalent of one position. However, it would impact by adding workload to the supporting unit organization by adding workload and possibly drive additional position requirements there. This depends upon a 31V MOS being present at the supporting unit and having the capacity to absorb the added workload. The added 63B workload will justify adding a new position to the supporting units organizational maintenance allowance.

3.3.2 FLIR RPV Direct Support Maintainers

As was the case for the 12 hour scenario, the 24 hour scenario normally drives DS positions with workload that

Table 3.3-1

Workload High Drivers (MH/Month)

Workload Category	Ranking	Reference O&O	Reference Sustained	Baseline O&O	Baseline Sustained
OM	1	AVOPS Control 1363.32	AVOPS Control 1254.24	AVOPS Control 1363.32	AVOPS Control 1254.24
	2	Generator Operator 678.72	Generator Operator 678.72	Generator Operator 678.72	Generator Operator 678.72
	3	Site Displacement 569.98	Site Displacement 569.98	Site Displacement 569.98	Site Displacement 569.98
INDL	1	Resupply 125.50	Resupply 125.50	Resupply 125.50	Resupply 125.50
	2	Pers Supervision* 80.07	Pers Supervision* 80.07	Pers Supervision* 80.07	Pers Supervision* 80.07
	3	Non-AV Briefs 15.15	Non-AV Briefs 15.15	Non-AV Briefs 15.15	Non-AV Briefs 15.15

NOTE: *Included only WO/E7 personnel administration/counciling workload.

Table 3.3-1 (Continued)

Workload High Drivers (MH/Month)

Category	Ranking	Reference O&O	Reference Sustained	Baseline O&O	Baseline Sustained
PM	1	Wheeled * Vehicles 331.68	Wheeled* Vehicles 331.68	Wheeled * Vehicles 331.68	Wheeled* Vehicles 331.68
	2	Air ** Vehicle 183.01	Air ** Vehicle 116.39	Air ** Vehicle 183.01	Air ** Vehicle 116.39
	3	GCS *** 97.91	GCS *** 97.91	GCS *** 97.91	GCS *** 97.91
CM	1	Air Vehicle 59.49	Air Vehicle 55.20	GCS *** 29.96	GCS *** 25.72
	2	GCS *** 49.97	GCS *** 41.52	Air Vehicle 26.88	Air Vehicle 24.78
	3	Wheeled * Vehicles 19.80	Wheeled * Vehicles 18.05	Wheeled * Vehicles 15.62	Wheeled* Vehicles 14.4[illegible]

NOTE: *Wheeled vehicles PM/CM does not include maintenance for carried RPV subsystems/equipments.

**Approximately 75% of this PM is associated with AV prelaunch preparation and is normally performed outside the maintenance shelter.

***Includes associated Ground Support Equipments.

does not completely fill its capacity. In these cases, if the required MOS exists in the proper DS maintenance organization/unit, it would be worthwhile to investigate existing assigned workload to determine if it could absorb RPV-driven workload without adding new positions. The notable exception to this case is the 63W, where enough workload at different skill levels exists to warrant adding up to three DS positions. Workload for the 63W increased because of vehicle usage associated with the significant increase (2.56 times) in numbers of AV launches and recoveries. This impacted on the maintenance requirements for launch/recovery and air vehicle handling vehicles.

For the 24 hour scenario, one additional site displacement increases DS workload by about 0.4 hours (1.6 hours for four sections) for the baseline system and 0.9 hours (3.6 per platoon) for the reference system; most of this workload is associated with the wheeled vehicle maintainers. Further, each AV launch/recovery cycle results in adding about the same number of hours to baseline/reference system DS workload, respectively; 0.5 and 1.0 hours per section supported. Significant increases in DS workload will result from increasing the number of section displacement cycles to two per day or number of launches to six per day.

SECTION 4 - DETERMINE TRAINING RESOURCE REQUIREMENTS

4.1 STUDY CONSIDERATIONS

This section describes the results of the RPV Training Resource Requirements Analysis (TRRA) and outlines the general procedures that were employed. This analysis is an extension of the initial Remotely Piloted Vehicle TRRA. A more detailed discussion of the procedures employed may be found in this initial report and in the Army Research Institute's (ARI) Technical Report on the application of the HARDMAN methodology to the Division Support Weapon System. The overall purpose and scope of the RPV analysis are discussed in Section 1 of this report. These objectives were further refined into the following TRRA objectives:

o Update the baseline training pipeline which will support section manning and operation by:

a) Updating the existing training pipeline and course analysis to incorporate FQQPRI skill level changes.

b) Updating the existing maintenance MOS assignments and courses to reflect FQQPRI MOS changes.

c) Updating the existing operation and maintenance courses to include the training requirements for the Forward Looking Infrared (FLIR) mission payload subsystem (FMPS).

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d) Updating the existing operator courses to include newly-received training information that is more comparable to the RPV system.

e) Updating the training resource requirements analysis to reflect changes in the student loads created by the 24 hour/FLIR operational scenario.

- Identify the differences in training resource requirements between the existing 12 hour daylight operational scenario and the 24 hour/FLIR operational scenario by:

  a) Identifying courses impacted.

  b) Identifying changes in course content and length.

  c) Identifying changes in instructor requirements.

All of the training assumptions made in the initial TRRA remained the same, except for one which was modified to incorporate changes in the FQQPRI that reflect system maintenance responsibility for the Warrant Officer.

- The RPV Warrant Officer will have responsibility for the supervision of the tactical employment of the RPV system and will also be a qualified maintenance technician.

4.2 TRAINING RESOURCE REQUIREMENTS ANALYSIS (TRRA)

All of the major steps in a general Training Resource Requirements Analysis (TRRA) were conducted for the update of the RPV study. Training data that had been requested for the previous study and not received, was subsequently received. The analysis and inclusion of this new data was accomplished. The content and quality of this new data has improved the estimation of the training requirements for the RPV operators. Many of the changes found in the tables and figures that follow are due to these changes in the updating of the available data.

Table 4.2-1 shows the RPV MOS's selected for the updated reference and baseline systems. One new MOS was added due to a change in the FQQPRI. This new MOS is a Weapons Support Radar Repairer (26B) at skill levels 1 and 2 and Combat Area Surveillance Radar Repairer (26C) at skill level 3. MOS 31V (Tactical Communications Systems Operator/ Mechanic) and MOS 63B (Light Wheel Vehicle/Power Generation Mechanic) were deleted because they perform organizational maintenance on RPV equipment outside of the RPV section. The assignments of these MOSs to their respective equipment are found in Appendix C.

Once the MOS had been determined, the existing resident courses of instruction associated with the MOS were identified (Ref. 6). Table 4.2-2 summarizes the RPV technical courses of instruction. The entry level course for MOS 26B (104-26B10) was the only new course added. The courses required by MOSs 31V and 63B were deleted.

Table 4.2-1

Summary of RPV MOS and ASI

MOS	CMF	Skill Level	Title (with abbreviation)
13T	13	1-4	Remotely Piloted Vehicle Crewman (RPV Crewman)
13TP9	13	1-2	Remotely Piloted Vehicle Mechanic (RPV Mech)
26B	29	1-2	Weapons Support Radar Repairer (Weapons Spt Rdr Rep)
26C	29	3	Combat Area Surveillance Radar Repairer (Cbt Area Svl Rdr Rep)
26L	29	1-3	Tactical Microwave System Repairer (Tac Mwave Sys Rep)
26T	84	1-3	Radio/Television Systems Specialist (Rdo/TV Sys Sp)
31E	29	1-3	Field Radio Repairer (*)
31J	29	1-3	Teletypewriter Repairer (Teletypewriter Rep)
31S	29	1-3	Field General COMSEC Repairer (Field Gen COMSEC Rep)
34Y	74	1-3	Field Artillery Computer Repairer (FA Computer Rep)
35E	29	1-3	Special Electronics Devices Repairer (Sp Elec Devices Rep)
35H	29	1-3	Calibration Specialist (*)
36H	29	1-3	Dial/Manual Central Office Repairer (Dial/Man Cen Ofc Rep)
41B	81	1-2	Topographic Instrument Repair Specialist (Topo Inst Rep Sp)
41C	63	1-3	Fire Control Instrument Repairer (FC Instrument Rep)
43M	76	1-3	Fabric Repair Specialist (Fabric Repair Sp)

Table 4.2-1

Summary of RPV MOS and ASI (continued)

MOS	CMF	Skill Level	Title (with abbreviation)
44B	63	1-2	Metal Worker (*)
44E	63	3	Machinist (*)
45B	63	1-2	Small Arms Repairer (*)
45G	63	1-3	Fire Control Systems Repairer (FC Systems Rep)
45K	63	3	Tank Turret Repairer (*)
52C	63	1-3	Utilities Equipment Repairer (Utilities Equip Rep)
52D	63	1-3	Power Generation Equipment Repairer (Pwr Gen Equip Rep)
63G	63	1-2	Fuel and Electrical Systems Repairer (Fuel & Elec Sys Rep)
63H	63	3	Track Vehicle Repairer (Track Veh Rep)
63J	63	1-3	Quartermaster and Chemical Equipment Repairer (QM & Chem Equip Rep)
63W	63	1-2	Wheel Vehicle Repairer (Wveh Rep)
82D	81	3	Topographic Surveyor (*)
211BO	-	-	Remotely Piloted Vehicle Technician (RPV Tech)

*Indicates no abbreviation

Table 4.2-2

Summary of RPV Technical Courses of Instruction

MOS	Skill Level 1	Skill Level 2	Skill Level 3
13T	XXX-13T10 XXX-13TP9	None	XXX-13T30
26B	104-26B10	None	None
26L	101-26L10	None	None
26T	G3ABR30435	None	None
31E	101-31E10	None	None
31J	113-31J10	None	None
31S	160-31S10	None	None
34Y	041-34Y10	None	None
35E	198-35E10	198-35E20	None
35H	G3ABR3240-003	G3AZR32470-000	198-35H30
36H	622-36H10	None	None
41B	670-41B10	None	None
41C	670-41C10	None	None
43M	760-43M10	None	None
44B	704-44B10	None	702-44E30
45B	641-45B10	None	643-45K30
45G	113-45G10	None	None
52C	662-52C10	662-52C20	None
52D	662-52D10	662-52D20	None
63G	610-63G10	None	611-63H30
63J	690-63J10	None	690-63J30
63W	610-63W10	None	611-63H30

211B0 Warrant Officer Course: XX-211B

A revision of the proposed RPV-specific courses is shown in Figure 4.2-1. This proposed training course pipeline represents a possible plan for providing training and is based on the present career progression plans for the RPV section personnel. This training configuration was followed in estimating the RPV operator and organizational maintenance training requirements. Added to this pipeline at paygrade E6 is a new course (Field Artillery Cannon NCO Advanced Course) to provide training for the RPV Section Chief and Platoon Sergeant. The addition of this new course is again due to changes in the FQQPRI.

At this point, the existing reference courses were reviewed and updated. First, the FQQPRI and FLIR MOS differences were identified. Next, the new training materials received for the study were reviewed and new comparable training was selected where appropriate. Some training in the Basic Technical Course (XXX-13T30) was taken from the new Field Artillery Cannon Fire Support Specialist Basic Noncommissioned Office Course (BNCOC) program of instruction (POI), and some training and course data in the RPV Warrant Officer Course (XX-211B) was taken from the new Target Acquisition Radar Technician Course (4C-211A) Program of Instruction (POI). Once the reference training courses were configured, the existing baseline training courses were modified to reflect the new FQQPRI MOS assignments and new training materials received. As shown in Table 4.2-3, a total of nine courses were developed or modified to reflect the reference equipment, then six of these courses were modified to reflect differences between the reference and baseline systems. Table 4.2-4 shows the affects of these differences on course length in man-days. Table 4.2-5 highlights the course topic and training time differences between the two

Figure 4.2-1. Proposed Training Course Pipeline

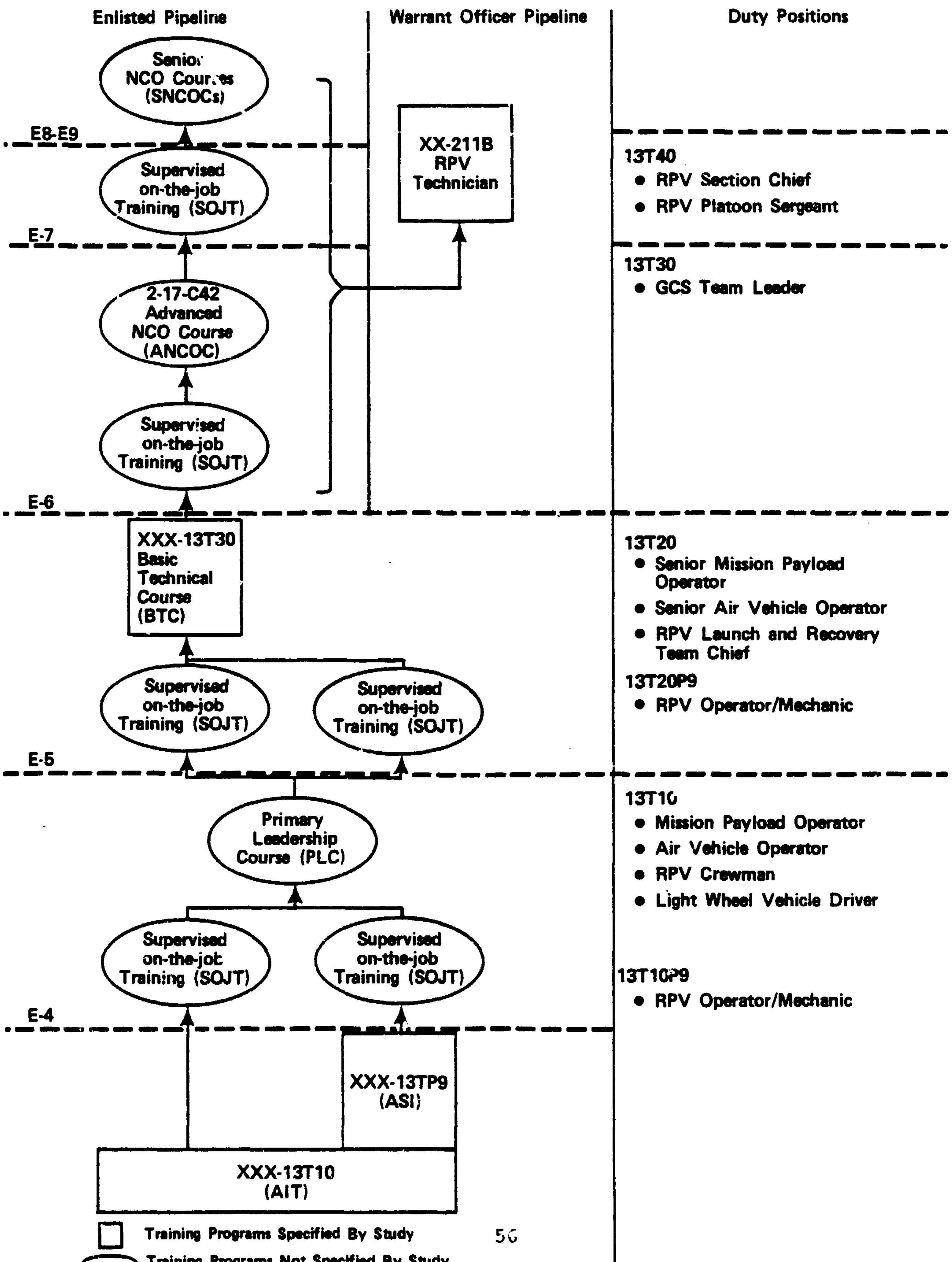

Table 4.2-3

New and Modified Courses by System

MOS	Course Number	Course Title	Reference	Baseline
13T	XXX-13T10	RPV Crewman	1	10
	XXX-13TP9	RPV Mech	2	11
	XXX-13T30	RPV BTC	3	3
26B	104-26B10	Weapons Spt Rdr Rep	4	4
26L	101-26L10	Tac Mwave Sys Rep	5	12
26T	G3ABR30435	Radio/TV Sys Rep	NC	--
31E	101-31E10	Field Radio Repairer	6	13
31J	113-31J10	Teletypewriter Rep	NC	NC
31S	160-31S10	Field Gen COMSEC Rep	NC	NC
34Y	041-34Y10	FA Computer Rep	7	NC
35E	198-35E10	Sp Elec Devices Rep	8	14
35H	G3ABR3240-003	Calibration Specialist	NC	NC
36H	622-36H10	Dial/Man Cen Ofc Rep	NC	NC
41B	670-41B10	Topo Inst Rep Sp	NC	NC
41C	670-41C10	FC Instrument Rep	NC	NC
43M	760-43M10	Fabric Repair Sp	NC	NC
44B	704-44B10	Metal Worker	NC	NC
45B	641-45B10	Small Arms Repairer	NC	NC
45G	113-45G10	FC Systems Rep	NC	--
52C	662-52C10	Utilities Equip Rep	NC	NC
52D	662-52D10	Pwr Gen Equip Rep	NC	NC
63G	610-63G10	Fuel and Elec Sys Rep	NC	NC
63J	690-63J10	QM & Chem Equip Rep	NC	NC
63W	610-63W10	Wveh Rep	NC	NC
211BO	XX-211B	RPV Tech	9	15

NC No change from existing course

-- No course required for system

Table 4.2-4

RPV Course Impacts

MOS	Course	Reference	Baseline
13T	XXX-13T10	New 55.8 M.D.	New 50.0 M.D.
	XXX-13TP9	New 63.1 M.D.	New 42.1 M.D.
	XXX-13T30	New 21.1 M.D.	New 21.1 M.D.
26B	104-26B10	Added 1.5 M.D.	Added 1.5 M.D.
26L	101-26L10	Added 17.0 M.D.	Added 4.7 M.D.
26T	G3ABR20435	NC	--
31E	101-31E10	Added 5.8 M.D.	Added 3.1 M.D.
31J	113-31J10	NC	NC
31S	160-31S10	NC	NC
34Y	041-34Y10	Added 17.4 M.D.	NC
35E	198-35E10	Added 18.5 M.D.	Added 3.6 M.D.
	198-35E20	NC	NC
35H	G3ABR3240-003	NC	NC
	G3AZR32470-000	NC	NC
	198-35H30	NC	NC
36H	622-36H10	NC	NC
41B	670-41B10	NC	NC
41C	670-41C10	NC	NC
43M	760-43M10	NC	NC
44B	704-44B10	NC	NC
	702-44E30	NC	NC
45B	641-45B10	NC	NC
	643-45K30	NC	NC
45G	113-45G10	NC	--
52C	662-52C10	NC	NC
	662-52C20	NC	NC
52D	662-52D10	NC	NC
	662-52D20	NC	NC
63G	610-63G10	NC	NC
	611-63H30	NC	NC
63J	690-63J10	NC	NC
	690-63J30	NC	NC
63W	610-63W10	NC	NC
	611-63H30	NC	NC
211BO	XX-211B	New 91.8 M.D.	New 74.0 M.D.

NC No change from existing course M.D. Man-days

-- No course required for system

Table 4.2-5

Operator Course Topics and Training Times

Course: XXX-13T10

Previous Annex	Topic	Previous Baseline Hours	Previous Baseline Change Note	New Annex	New Reference Hours	New Reference FLIR/24 HRΔ	New Baseline Hours	New Baseline FLIR/24 HRΔ
A.	System Introduction, Technical Manual Introduction	4.3	-	A.	4.3		4.3	
B.	Launch Vehicle, Recovery Vehicle, Handling Vehicle and System Emplacement Operations	56.0	1	B.	76.0		76.0	
C.	Communications/ COMSEC Procedures	55.4	1	C.	55.3		55.3	
D.	Plotting/Charting/ Map Reading Procedures	41.5	4	D.	47.1		-	
E.	Navigation Display Panel Operation	2.0	1	F.	8.2		8.2	
F.	Ground Data Terminal Control and Display Operations	9.2	-	G.	9.2		9.2	
G.	Air Vehicle Command and Display Console Operations	73.8	1	H.	81.4		81.4	
H.	Mission Payload Command and Display Console Operations (Includes FLIR System Operation)	115.0	1,2	I.	119.0	Added 3.0	119.00	Added 3.0

Table 4.2-5 (Continued)

Course: XXX-13T10

Previous Annex	Topic	Previous Baseline Hours	Previous Baseline Change Note	New Annex	New Reference Hours	New Reference FLIR/24 HRΔ	New Baseline Hours	New Baseline FLIR/24 HRΔ
I.	Organizational and Crew Maintenance	10.4	1	J.	28.9		28.9	
J.	Weather (MET)	6.5	3		-		-	
K.	Survey	10.5	3		-		-	
L.	Digital Message Device Operation	5.1	3		-		-	
M.	Processor Start-Up and Data Entry	12.0	4	E.	17.3		17.3	
	TOTALS	407.7			446.7	Added 3.0	399.6	Added 3.0

Notes:
1. Change due to updating original analysis.
2. Change due to addition of FLIR and 24 hour operational scenario.
3. Change due to reassignment in FQQPRI of topic area to higher skill level.
4. Change due to the planned automation of flight control.

Table 4.2-5 (Continued)

Course: XXX-13T30

Previous Annex	Topic	Previous Baseline Hours	Previous Baseline Change Note	New Annex	New Reference Hours	New Reference FLIR/24 HRΔ	New Baseline Hours	New Baseline FLIR/24 HRΔ
A.	Battalion Training Management System (BTMS) and Required Common Subjects	21.9	4	A.	40.0		40.0	
B.	Weather (MET)	14.0	2	B.	29.0	Added 15.0	29.0	Added 15.0
C.	Navigation	13.1	1	C.	13.0		13.0	
D.	Intelligence	10.9	1	D.	16.0		16.0	
E.	Field Artillery and RPV Missions/Tactics	24.4	4	E.	36.0		36.0	
F.	Fire Support Duties	85.3	3		-		-	
	Digital Message Device Operation	-	3	F.	5.1		5.1	
G.	Target ID/Calls for Fire (Fire Support Tactics)	32.0	4	G.	10.0		10.0	
H.	Survey	10.9	3		-		-	
I.	Convoy and Route Planning	2.5	3		-		-	
J.	FA Communications Systems	1.7	4	H.	4.0		4.0	
K.	IM-93/IM-174/PD	1.5	4		-		-	
	Diagnostic and End of Course Exam	-	4	I.	16.0		16.0	
	TOTALS	218.2			169.1	Added 15.0	169.1	Added 15.0

Table 4.2-5 (Continued)

Notes:

1. Change due to updating original analysis.
2. Change due to addition of FLIR and 24 hour operational scenario.
3. Change due to reassignment in FQQPRI of topic area to higher skill level.
4. Change due to use of MOS 13F30 (Field Artillery Cannon Fire Support Specialist Basic Noncommissioned Officer Course) POI for training estimation.

Table 4.2-5 (Continued)

Course: XX-211B

Previous Annex		Previous Baseline Hours	Previous Baseline Change Note	New Annex	New Reference Hours	New Reference FLIR/24 HRΔ	New Baseline Hours	New Baseline FLIR/24 HRΔ
A.	Leadership	22.1	-	A.	22.1		22.1	
B.	Supply	28.6	-	B.	28.6		28.6	
C.	Maintenance Management	36.2	1	C.	32.0		32.0	
D.	Emergency Destruction	.9	-	D.	.9		.9	
E.	Air Ground Navigation Review	26.9	-	E.	26.9		26.9	
F.	Mission Planning	71.0	1	F.	74.5		74.5	
G.	Target Identification and Calls for Fire	44.6	1	G.	44.4		44.4	
H.	Field Artillery Communications	6.8	1	H.	9.3		9.3	
I.	NBC Operations	8.5	3		-		-	
	Survey	-	2	I.	4.2		4.2	
	Convoy Route Planning and Emplacement Planning	-	2	J.	15.8		15.8	
	System Organizational Maintenance	-	2,4		475.5		332.9	
	TOTALS	245.6			734.2		591.6	

Notes:
1. Change due to updating original analysis.
2. Change due to reassignment in FQQPRI of topic area to higher skill level.
3. Change due to use of MOS 211A (Target Acquisition Radar Technician) POI for training estimation.
4. Change due to new assignment of responsibility for system maintenance.

studies and between the reference and baseline systems in the new study. Brief notes are provided on the table to identify the sources of differences.

As shown in Table 4.2-6, significant differences in skill level and grade still exist in the new XXX-13T10 course. However, significant improvements were achieved in the XXX-13T30 course from the change in the FQQPRI increasing the RPV Section Chief to paygrade E7. Much of the necessary training that in the previous study had been shifted down to paygrade E6 (the former RPV Section Chief grade) from the Field Artillery Cannon NCO Advanced Course (0-B-C42) will now be received by the RPV Section Chief in this course. Still, a substantial portion of the other two baseline operator courses was derived from existing courses which are at a higher grade level. As pointed out in the previous study, these high skill requirements and low grade authorizations may mean that system performance requirements will not be achieved. While substantial improvements have now been made at the section chief level, further study and consideration should be given to resolving the differences and reassessing the proposed grade structure at the lower grades.

Table 4.2-7 shows the impacts of the various design configurations on maintenance training. No changes occurred in either of the organizational maintenance training courses (XXX-13TP9), because the service and remove/replace tasks required for the FLIR mission payload system were judged to be similar to the tasks performed on the TV mission payload system assemblies. Direct support maintenance training for the navigation display unit was shifted from the 041-34Y10 course to the 104-26B10 course, while direct support

Table 4.2-6

Reference to Baseline Skill/Grade Differences

Course Topic/ Equipment	Reference Training Source with Grade	Baseline Course Assignment	RPV Grade
AV Recovery AN/PVS-5 Night Vision Goggles	Officer/WO Rotary Wing Aviator Course 2C-15A/2C-100B-B (Officer/WO)	XXX-13T10	E1-E4
Plotting and Charting Aircraft Routes		o	o
Navigation Display Panel Operation	TACFIRE Operations Specialist 13C (BTC) (E6)	o	E4
Ground Data Terminal Control and Display Operations			
RPV Aerodynamics	OV-1 Instructor Pilot Course 2B-F5 (Officer/WO)	o	o
AV Command Display Console Operation	Officer/WO Rotary Wing Aviator Course 2C-15A/2C-100B-B (Officer/WO)	o	o
Target Identification	Image Interpreter PTC 242-96D20 (E5) Officer/WO Rotary Wing Aviator Course 2C-15A/2C-100B-B (Officer/WO)	o	o
Aerial Adjustment of Artillery		o	o
Target Ranging Laser Designation	Field Artillery Officer Basic 2-6-C20-13E (Officer)	o	o

o same as above

Table 4.2-6 (Continued)

Course Topic/ Equipment	Reference Training Source with Grade	Baseline Course Assignment	RPV Grade
Flight Planning/ Weather	Officer/WO Rotary Wing Aviator Course 2C-15A/2C-100B-B (Officer/WO)	XXX-13T30	E6
Flight Planning/ Navigation		o	o
Digital Message Device Operation	Field Artillery Officer Basic 2-6-C2D-13E (Officer)	o	o
Leadership	Field Artillery Officer Basic 2-6-C20-13E (Officer)	XX-211B	Warrant Officer
Training Management (Unit)		o	o
Logistics Management Supply/ Maintenance		o	o
Navigation		o	o
Mission Planning		o	o
Target Identification and Calls for Fire		o	o
Communications		o	o
NBC Operations		o	o

o same as above

Table 4.2-7

Maintenance Course Topics and Training Times

Course: XXX-13TP9

LCN	Equipment Name	Additional Hours Reference	Additional Hours Baseline
OAAM,OAAMAB	Propulsion System, Engine Module	6.0	
OAAH,OAAX	Airspeed and Altitude (A&A) Sensors	4.0	
OAAJ	Attitude Reference Assembly	11.0	
OAAL,OASA, OAEA	Flight Control Electronic Package, Control Actuators	25.0	
OAALAB	Central Processing Unit (CPU) Module Assembly	30.0	
OAAWAF	Airborne Data Terminal (ADT)	35.7	
OEAAB,OEAAD	Television Camera, Main Optics Assembly	6.0	
OEAAC,OEAAE	Laser System	3.0	
OEAAF-OEBAA	Mission Payload System Assemblies	13.0	
	AIR VEHICLE SUBTOTAL	133.7	
OAS	Handling Crane	2.0	
OAL,OAT	AV Recovery Harness, AV Container	.9	
	AIR VEHICLE HANDLER SUBTOTAL	2.9	
ODAA3	Radiac Meters	2.0	
ODAA3AE	Power Monitor	3.0	
ODAC2	Video Reconstruction Unit	5.0	
ODAC3	Master Interface Unit (MIU)	6.7	
ODADA,ODAEA ODAFA	Video Monitor	5.0	
ODADG	Ground Data Terminal Control Display	2.0	
ODADH	AV Control & Display Assembly	4.0	
ODAEH	Mission Payload Control & Display Assembly	4.0	
ODAFH	Mission Commander's Control & Display Assembly	4.5	
ODAFK	Video Recorder Assembly	2.0	
ODAGB	Teleprinter Assembly AN/UGC-74	2.0	
ODAJ	Navigation Display Unit	4.0	
ODALAAA	Computer/Signal Processor Rack Code Assembly	3.4	

Table 4.2-7 (Continued)

Course: XXX-13TP9

LCN	Equipment Name	Additional Hours Reference	Baseline
ODALBAA	Main Computer	33.6	
ODALD	Interface Unit	6.7	
OD6	Training Interface Unit, Imagery Simulator	28.2	
OD7	Portable Data Entry Device	1.0	
	GROUND CONTROL STATION SUBTOTAL	117.1	
OBB	Initializer Assembly	16.1	
OBC	Launcher Assembly	32.0	
OBCAAAF	Launcher Control Panel	2.0	
OBD	Launcher Command Module	1.0	
	LAUNCHER SUBSYSTEM SUBTOTAL	51.1	
OGQ	AV Fault Isolator	15.0	
OGR	Nitrogen Purge Set	4.2	
XWL6,XWL7	Multimeters	1.7	
	MAINTENANCE SHELTER SUBTOTAL	20.9	
OCA	Recovery Assembly	7.0	
OCB	Recovery Guidance Assembly	5.0	
	RECOVERY SUBSYSTEM SUBTOTAL	12.0	
MRGT	Antenna	7.0	
MRGT1	Remote Ground Terminal Electronics	38.0	
	REMOTE GROUND TERMINAL SUBTOTAL	45.0	
General Subject Areas:			
Course Introduction, Components Familiarization, Initialization, System Programs, Review, Preventive Maintenance, Manuals, System Troubleshooting, Etc.		92.8	
	TOTAL ACADEMIC TIMES	475.5	332.9[1]

[1]The reference system time was reduced by 30% in the baseline system in order to reflect planned built-in test and other diagnostic capabilities.

Table 4.2-7 (Continued)

LCN	Equipment Name	Additional Hours Reference	Additional Hours Baseline
Course: 104-26B10			
ODAJ	Navigation Display Unit	12.0	12.0
Course: 101-26L10			
ODAC3	Master Interface Unit	14.3	
OBB	Initializer Assembly	37.8	37.8
MRGT	RGT Antenna	21.0	
MRGT1	Remote Ground Terminal Electronics	63.0	
	TOTALS	136.1	37.8
Course: 101-31E10			
ODAB8,ODAB9	Communications Mode Selector Control	24.5	24.5
ODADE,ODAEE, ODAFE	Communications Panel Assembly	22.0	
	TOTALS	46.5	24.5
Course: 041-34Y10			
OAALAB	Central Processing Unit Module Assembly	51.0	
ODADG	Ground Data Terminal Control Display	3.0	
ODADH	AV Control & Display Assembly	8.0	
ODAEH	Mission Payload Control & Display Assembly	8.0	
ODAFH	Mission Commander's Control & Display Assembly	10.2	
ODALBAA	Main Computer	47.2	
ODALD	Interface Unit	13.8	
	TOTALS	139.2	0.0
Course: 198-35E10			
OAAJ	Attitude Reference Assembly	64.0	
OCB	Recovery Guidance Assembly		29.0
OEAAF-OEBAA	Mission Payload System Assemblies	84.0	
	TOTALS	148.0	29.0

maintenance training for the recovery guidance assembly in the baseline system was moved from the 610-63W10 course to the 198-35E10 course. Both of these changes were made due to changes in the FQQPRI.

The total course length for the reference 13TP9 course of 63.1 man-days (12.6 weeks) is the same as in the previous study and represents a substantial amount of organizational maintenance training. The course length for the baseline 13TP9 course (42.1 man-days) was based solely on engineering and training judgment. Most systems fielded in the Army at this time do not contain automated test equipment (ATE) or built-in test (BIT) equipment. The result was that comparability analysis could not be used to assess this RPV design parameter. Based on the collective knowledge and experience of the DRC engineering and training analysts, it was estimated that 30% of the troubleshooting training contained in the reference course could be eliminated if some form of reliable, automatic fault isolation capability was installed in the contractor furnished equipment. However, it must be noted that this projection is based on the assumption that the test capability will be dependable and will achieve the 95% fault isolation planned. A small number of developmental and recently fielded Army systems with BIT are known by DRC analysts to have not achieved their desired rate of fault isolation. Should this occur with RPV, alternate trouble-shooting training as found in the reference training course would be required. In either case, sufficient training will exist to justify the requirement for an RPV-specific organizational maintenance MOS.

The direct support (DS) maintenance requirements identified for the reference system in Table 4.2-7 and summarized in Table 4.2-4, represents DS maintenance that was identified for comparably fielded equipment chosen for training estimation. The total of all new projected DS maintenance training for the reference system amounts to 60.2 man-days (12.0 weeks). This does not include the RPV maintenance requirements that were assigned to existing DS maintainers who were deemed to require no additional training due to the existence of previously attained skills and knowledges. However, the baseline system requires only 12.9 man-days (2.6 weeks) of additional DS maintenance training. This significant difference is due to the small amount of maintenance being assigned to the direct support echelon of maintenance in the logistics support analysis (LSA).

The shifting of DS maintenance workload to the general support (GS) and depot maintenance levels has two implications. First, a much higher number of line replaceable units (LRU's) and other maintenance repair spares will have to be maintained in the inventory, as the repair process will probably take longer. Secondly, very little training savings will be achieved as virtually all DS and GS maintainers attend the same courses. Preliminary studies underway within the Army to combine the DS and GS categories of maintenance into one, would also negate any savings achieved by having maintenance performed at the GS level.

The difference of 47.3 man-days of DS maintenance training from the reference to the baseline system, is a hidden "cost" with the baseline system. Personnel will obviously have to be trained at either the GS or depot level to repair these subsystems. The creation of a DS/GS maintenance MOS may be required, but any such decision, as with a possible organizational maintenance MOS, involves a complicated set of personnel and training factors that would need to be studied.

The success of the present RPV training program, as illustrated in Figure 4.2-1 and as mentioned in the initial study, will depend to a large degree on the supervised on-the-job training (SOJT) program. The availability of the RPV equipment, training interface unit, and training time, the required proficiency of the unit, the cross training of maintainers to operators, and the skill development of junior system operators will have to be carefully coordinated within a section. This is further complicated by the complex nature of team performance during the conduct of a flight mission. A well-defined structure of formal training, MOS proficiency certification, and supervised unit training will be required. As the XXX-13T10 course is now configured, the majority of the training will be on ground control station (GCS) operation. The graduate of this course is not likely to perform in this capacity until he is a senior E4 or a junior E5, 2 to 3 years after assignment to a unit. The training provided on GCS operation will have to be repeated when the soldier moves into the GCS, unless the SOJT program insures retention of these skills and knowledges. An alternative approach might be to concentrate XXX-13T10 training on launcher subsystem operations, recovery subsystem operations, air vehicle handling operations, and vehicle driving. This would necessitate the development of a Primary Technical Course (PTC) at paygrade E5 that would be devoted to GCS operation.

4.3 IDENTIFY RPV TRAINING ANALYSIS RESULTS

Two parameters were chosen to depict the training resource requirements for RPV:

- o Training man-days - the length of time needed to train an individual in a course.

- o Instructors - the number of instructors required to conduct a course of instruction (COI).

The selection of these parameters takes into consideration (1) the training data available for analysis, and (2) the level and kinds of meaningful training resource estimation needed by the program office to make decisions at this stage in the acquisition process. As the RPV system is further defined, subsequent iterations of the methodology allow for more detailed and varied analyses of training resource requirements

4.3.1 FLIR RPV Training Man-days

The number of man-days required for training was obtained from the POI for those courses that did not change and from course modification worksheets for those courses that did. Table 4.3.1-1 is a summary of the annual training man-day requirements for RPV. The reference 3/2 shift manning configuration will have the largest total requirement for training time, while the baseline sustained scenario will have the least.

Table 4.3.1-1

Annual Training Man-Days

MOS	Course	Reference Sustained	Reference 3/2 Shift	Baseline Sustained	Baseline 3/2 Shift	FQQPRI RPV Sectic
13T	XXX-13T10	27,392	46,727	24,545	41,870	30,320
	XXX-13TP9	8,998	8,998	6,003	6,003	6,791
	XXX-13T30	722	722	722	722	722
26B	104-26B10	1,828	1,828	1,828	1,828	
26L	101-26L10	3,526	3,526	3,306	3,306	
26T	G3ABR30435	821	821	-	-	
31E	101-31E10	2,633	2,633	2,577	2,577	
31J	113-31J10	1,375	1,375	1,375	1,375	
31S	160-31S10	1,463	1,463	1,463	1,463	
34Y	041-34Y10	4,210	4,210	3,570	3,570	
35E	198-35E10	3,385	3,385	2,920	2,920	
35H	G3ABR3240-003	5,191	5,191	5,191	5,191	
36H	622-36H10	3,374	3,374	3,374	3,374	
41B	670-41B10	533	533	533	533	
41C	670-41C10	1,797	1,797	1,797	1,797	
43M	760-43M10	314	314	314	314	
44B	704-44B10	1,421	1,421	1,421	1,421	
45B	641-45B10	336	336	336	336	
45G	113-45G10	2,362	2,362	-	-	
52C	662-52C10	2,532	2,532	2,532	2,532	
52D	662-52D10	6,683	6,683	6,683	6,683	4,164
63G	610-63G10	3,278	3,278	3,278	3,278	
63J	690-63J10	482	482	482	482	
63W	610-63W10	2,932	2,932	2,295	2,295	
	TOTALS	87,588	106,923	76,545	93,870	

4.3.2 FLIR RPV Instructor Quantities

Estimation of the number of instructors associated with the system-specific RPV courses was determined by applying the new instructor determination and training course data provided by the Management Engineering Branch, TRADOC. Table 4.3.2-1 is a listing by system and MOS of the annual instructor requirement for RPV. The overall range of instructor requirements varied from 95.9 for the reference sustained scenario to 112.0 for the reference 3/2 shift scenario. Overall, the baseline sustained scenario was less intensive in the use of training resources than the other scenarios.

Table 4.3.2-1

Annual Instructor Requirements

MOS	Course	Reference Sustained	Reference 3/2 Shift	Baseline Sustained	Baseline 3/2 Shift	FQQPRI RPV Section
13T	XXX-13T10	21.5	36.6	20.3	34.6	25.1
	XXX-13TP9	15.8	15.8	11.1	11.1	12.5
	XXX-13T30	.6	.6	.6	.6	.6
26B	104-26B10	5.2	5.2	5.2	5.2	
26L	101-26L10	3.6	3.6	3.4	3.4	
26T	G3[illegible]R30435	.8	.8	-	-	
31E	101-31E10	1.8	1.8	1.7	1.7	
31J	113-31J10	1.1	1.1	1.1	1.1	
31S	160-31S10	1.6	1.6	1.6	1.6	
34Y	041-34Y10	8.5	8.5	7.6	7.6	
35E	198-35E10	3.6	3.6	2.8	2.8	
35H	G3ABR3240-003	2.8	2.8	2.8	2.8	
36H	622-36H10	2.7	2.7	2.7	2.7	
41B	670-41B10	.6	.6	.6	.6	
41C	670-41C10	2.0	2.0	2.0	2.0	
43M	760-43M10	.4	.4	.4	.4	
44B	704-44B10	1.0	1.0	1.0	1.0	
45B	641-45B10	.9	.9	.9	.9	
45G	113-45G10	3.4	3.4	-	-	
52C	662-52C10	3.9	3.9	3.9	3.9	
52D	662-52D10	6.5	7.5	6.5	7.5	4.8
63G	610-63G10	4.0	4.0	4.0	4.0	
63J	690-63J10	.6	.6	.6	.6	
63W	610-63W10	3.0	3.0	2.3	2.3	
	TOTALS	95.9	112.0	83.1	98.4	

SECTION 5 - DETERMINE PERSONNEL REQUIREMENTS

5.1 STUDY CONSIDERATIONS

The purpose of the Personnel Requirements Analysis (PRA) is to estimate the number of personnel needed to sustain any one set of system specific manpower requirements, typically those of a single Military Occupational Specialty (MOS). A PRA's major output is the number of personnel which must be trained per year to support manpower requirements; it's secondary output is a personnel structure.

It is important to note the difference between manpower and personnel requirements. A manpower requirement is a statement of the necessary number of people, described in MOS and paygrade, needed to directly perform a specific set of mission-oriented tasks for a particular weapon system. A manpower requirement is calculated based on the workload required for the task. A personnel requirement is an estimate of the number of people carried within the MOS and paygrade to offset various losses from the manpower requirement over a specified period of time. During the standard time period, one year, it is assumed that there are no changes to a manpower requirement ("steady-state"), hence the personnel requirements are due solely to the structure of the personnel system.

5.2 APPLICATION OF THE IMPACT MODEL TO THE FLIR/24 HOUR SCENARIO

The Interactive Manpower-Personnel Assessment and Correlation Technology (IMPACT) Model was developed by DRC as a tool to determine personnel requirements given (1) manpower requirements, (2) promotion rates; (3) attrition rates and (4) Trainees, Transients, Holdees and Students (TTHS) percentage.

The concept which underlies the IMPACT model is the conservation of people. This means that the quantities of personnel which leave a particular paygrade must be replaced by personnel entering that paygrade. The IMPACT model determines the quantities of personnel needed in the personnel structure to support specified manpower requirements and to sustain itself so that the personnel structure can account for incurred losses. The IMPACT model's objective is to calculate the minimum amount of personnel needed at each level in the personnel structure. It is constrained so that each paygrade must support losses from the next higher paygrade, since replacement for those losses must be promoted from the paygrade below. The process will iterate several times before the optimal structure is established.

The example in Table 5.2-1 shows the impact on personnel requirements when two different sets of manpower requirements are generated for the same MOS. The upper set illustrates the 12 hour scenario used in the initial RPV study and the lower set reflects the FLIR/24 hour scenario. With the incorporation of the FLIR/24 hour scenario, the total system personnel requirements increased by 41.7% for the baseline system utilizing sustained workload, and 142% increases between the 3/2 shift with shared workload and the Baseline O&O scenario. These increases reflect all parameters of the FLIR/24 hour scenario which generated more manpower positions and therefore a higher demand on the

Table 5.2-1 12 HOUR SCENARIO vs. FLIR/24 HOUR SCENARIO

MOS = 13T Recruits Per Year = 390.7

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YEAR	MANPOWER LOSSES PER YEAR	OVERHEAD LOSSES PER YEAR
E-1	213.6	0.	0.	390.7	0.	390.7
E-2	132.3	126.0	132.3	280.1	280.1	0.0
E-3	198.2	168.0	175.7	232.4	206.1	26.3
E-4	284.4	112.0	117.4	179.7	74.2	105.6
E-5	158.1	112.0	115.4	76.5	55.8	20.7
E-6	128.3	56.0	57.5	38.1	17.1	21.0
E-7	61.9	14.0	14.0	19.4	4.4	15.0

MOS = 13T Recruits Per Year = 837.4

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YEAR	MANPOWER LOSSES PER YEAR	OVERHEAD LOSSES PER YEAR
E-1	457.8	0.	0.	837.4	0.	837.4
E-2	283.5	0.	0.	600.2	0.	600.2
E-3	424.7	406.0	424.7	498.2	498.1	0.0
E-4	609.5	168.0	176.1	385.2	111.3	273.9
E-5	338.7	112.0	115.4	163.9	55.8	108.1
E-6	274.9	112.0	115.0	81.6	34.2	47.5
E-7	132.6	70.0	70.0	41.5	21.9	19.6

personnel system. Other specifics of the IMPACT model are contained in Section 6 of DRC's initial RPV study (Ref. 1).

5.3 MOS/PAYGRADE DEVELOPMENT

Steady-state personnel requirements of the personnel structure are the secondary output parameter of the IMPACT model.

Figure 5.3-1 illustrates the logic upon which the PRA is based, by showing two MOS's (A and B) at two paygrade levels (E1 and E2). The Personnel Requirements Analysis determines the size and structure of the personnel pipelines in steady state condition by estimating the losses that occur to a paygrade. Two main causes for MOS/paygrade losses are promotion and attrition. The definition of the promotion rate is the rate at which individuals advance from one paygrade to another. The attrition rate is the rate at which individuals leave a particular MOS/paygrade. Two types of attrition exist in the Army: (1) MOS attrition (horizontal attrition) and (2) Army attrition. Trainees, transients, holdees or students (TTHS) contribute to total force numbers, but are actually non-operational personnel and are classified as overhead. Individuals that comprise the TTHS category, while not a direct loss to the Army or paygrade since they will most likely become operational, are a substantial MOS/paygrade loss to the operational force and must be compensated for.

5.4 PAYGRADE DISTRIBUTION

As mentioned in Section 5.3, steady-state personnel requirements of the personnel structure are the secondary

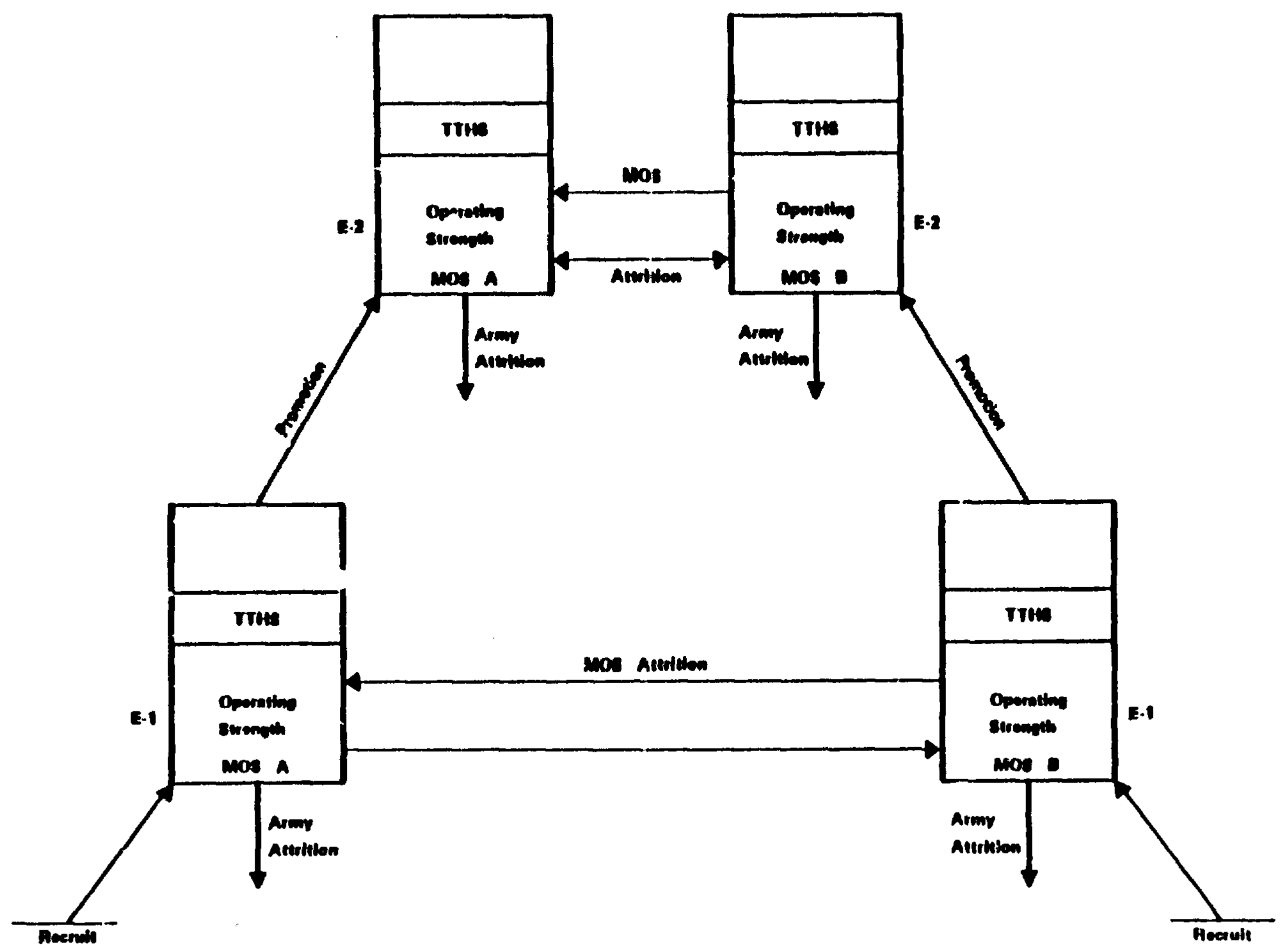

Figure 5.3-1. The Personnel Flow Diagram

output parameter of the IMPACT model. This parameter is used as a relative measure of the personnel requirements of one system as compared to those of another system. Replacement for losses primarily occur by promoting from the lower paygrade. Therefore, if manpower requirements begin at an E4 level, personnel are needed in lower paygrades to be promoted as manpower losses occur. These personnel requirements, over and above manpower requirements, are considered to be overhead supporting a particular weapon system, although they may potentially be used by another weapon system. A measure of the quantity and quality of the personnel structure provides an indication of how efficiently specific manpower requirements sustain themselves. For example, a structure of requirements which decreases as the paygrade spread increases (i.e., pyramidal structure) is more self-sustaining than the opposite situation. The example in Table 5.4-1 shows the impact on the personnel structure and personnel to be trained for two equal sets of manpower requirements with different grade distributions. The upper set illustrates that when the manpower requirements (column 3) for the E2 and E3 levels are aggregated at the E3 level, a larger demand for personnel exists. Thus, as manpower demands call for higher skill levels (paygrades), the structure becomes less self supporting.

5.4.1 FLIR RPV Recruit Requirements

The IMPACT model is currently a system-specific personnel model which is driven by steady-state manpower requirements. Because of this, it is assumed that manpower requirements

Table 5.4-1. Comparative Personnel Structure Impacts

MOS = 13T RECRUITS PER YEAR = 837.4

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YEAR	MANPOWER LOSSES PER YEAR	OVERHEAD LOSSES PER YEA
E-1	457.8	0.	0.	837.4	0.	837.4
E-2	283.5	0.	0.	600.2	0.	600.2
E-3	424.7	406.0	424.7	498.2	498.1	0.0
E-4	609.5	168.0	176.1	385.2	111.3	273.9
E-5	338.7	112.0	115.4	163.9	55.8	108.1
E-6	274.9	112.0	115.0	81.6	34.2	47.5
E-7	132.6	70.0	70.0	41.5	21.9	19.6

MOS = 13T RECRUITS PER YEAR = 629.5

E-1	344.2	0.	0.	629.5	0.	629.5
E-2	213.2	203.0	213.1	451.2	451.2	0.0
E-3	319.3	203.0	212.3	374.5	249.1	125.4
E-4	458.2	168.0	176.1	289.6	111.3	178.3
E-5	254.7	112.0	115.4	123.3	55.8	67.4
E-6	206.6	112.0	115.0	61.4	34.2	27.2
E-7	99.7	70.0	70.0	31.2	21.9	9.3

are already filled, and therefore, the personnel requirements represent the quantities and qualities of personnel which it takes to sustain these already filled manpower requirements. Table 5.4-2 shows the annual recruiting requirements for all the MOSs used in the RPV study. These requirements reflect the minimum number of recruits that need to be brought into the personnel pipeline in order to sustain RPV manpower requirements. With the FLIR/24 hour scenario, recruiting requirements increased over the requirements that supported the 12 hour scenario.

Table 5.4-3 shows the recruiting requirements for the fractional MOS concept, which is based on determining personnel requirements solely on workload as opposed to the "whole body". These personnel requirements are shown for DS maintenance elements only since this is where "shared" support will occur with other units. The fractional MOS consideration results in a lower demand on the personnel system.

5.5 IDENTIFY PERSONNEL ANALYSIS RESULTS

The RPV 13T MOS personnel structure indicates a larger demand at the E4 and E3 levels than is available from the inherent 13T E2 and E1 levels. This was in spite of accomplishing much of the non-skill level specific workload at the E2 level; e.g., vehicle drivers. There are a number of potential solutions to this "hump" in the structure, including (1) reinforcing the 13T MOS at the E4 level with personnel cross trained from another MOS, (2) cross training with other systems so that a greater E1 and E2 pool would be available (i.e., create a secondary MOS), or (3) shift

Table 5.4-2. Recruiting Requirements

	Reference		Baseline		
MOS	Sustained	3/2 Shift	Sustained	3/2 Shift	FQQPRI RPV Section
13T	490.9	837.4	490.9	837.4	606.4
13TP9	142.6	142.6	142.6	142.6	161.3
26B	15.3	15.3	15.3	15.3	
26L	17.9	17.9	17.9	17.9	
26T	10.8	10.8	-	-	
31E	20.6	20.6	20.6	20.6	
31J	12.5	12.5	12.5	12.5	
31S	22.5	22.5	22.5	22.5	
34Y	36.8	36.8	36.8	36.8	
35E	31.2	31.2	31.2	31.2	
35H	29.0	29.0	29.0	29.0	
36H	17.3	17.3	17.3	17.3	
41B	21.3	21.3	21.3	21.3	
41C	20.9	20.9	20.9	20.9	
43M	9.5	9.5	9.5	9.5	
44B	20.9	20.9	20.9	20.9	
45B	8.2	8.2	8.2	8.2	
45G	20.9	20.9	-	-	
52C	42.2	42.2	42.2	42.2	
52D	142.2	142.2	142.2	142.2	88.6
63G	44.9	44.9	44.9	44.9	
63J	11.2	11.2	11.2	11.2	
63W	54.3	54.3	42.5	42.5	

Table 5.4-3. Annual Recruiting Requirements Fractional MOS Consideration at the Direct Support (DS) Level

MOS	Reference Sustained	Reference 3/2 Shift	Baseline Sustained	Baseline 3/2 Shift
26B	0.8	0.8	0.1	0.1
26L	3.8	4.8	0.1	0.1
26T	3.4	4.3	-	-
31E	11.6	13.3	7.5	8.1
31J	3.7	3.7	0.8	0.8
31S	2.9	2.9	2.9	2.9
34Y	7.1	8.1	1.0	1.3
35E	1.1	1.5	0.2	0.2
35H	5.0	5.0	5.0	5.0
36H	1.2	1.2	1.2	1.2
41B	2.0	2.0	2.0	2.0
41C	0.1	0.1	0.1	0.1
43M	0.1	0.1	0.4	0.4
44B	1.9	2.1	1.9	2.2
45B	0.1	0.1	0.1	0.1
45G	7.5	10.6	-	-
52C	10.8	10.8	13.2	13.2
52D	8.5	9.6	7.4	8.1
63G	34.0	40.7	13.4	15.7
63J	0.1	0.1	0.1	0.1
63W	34.7	34.7	27.2	27.2

workload through the system engineering analysis to incorporate a greater E1 and E2 requirement.

Personnel requirements for the FQQPRI RPV section were calculated using the IMPACT model. Comparing the result against the operator requirements for the baseline system 3/2 shift, this analysis resulted in a 696 requirement increase in personnel for the baseline system 3/2 shift.

5.6 CALCULATE PERSONNEL REQUIREMENTS

Results of the IMPACT model for each of the Military Occupational Specialties (MOSs) considered in the RPV application are contained in Appendix D. Tables 5.6-1 through 5.6-4 are summary charts of these results, depicting personnel requirements by MOS including the DS fractional considerations by paygrades (with and without headquarters requirements) and includes the FQQPRI requirements as well.

Table 5.6-1 Personnel Requirements by MOS
(Includes Platoon Headquarters Requirements)

MOS	Reference Sustained	Reference 3/2 Shift	Baseline Sustained	Baseline 3/2 Shift	FQQPRI RPV Section
13T	1478	2522	1478	2522	1826
13T*	1391	2435	1391	2435	1739
13TP9	360	360	360	350	407
26B	39	39	39	39	
26L	59	59	59	59	
26T	31	31	-	-	
31E	44	44	44	44	
31J	34	34	34	3[illegible]	
31S	51	51	51	51	
34Y	97	97	97	97	
35E	90	90	90	90	
35H	82	82	82	82	
36H	43	43	43	43	
41B	42	42	42	42	
41C	44	44	44	44	
43M	27	27	27	27	
44B	69	69	69	69	
45B	27	27	27	27	
45G	47	47	-	-	
52C	125	125	125	125	
52D	293	293	293	293	182
63G	111	111	111	111	
63J	31	31	31	31	
63W	147	147	115	115	

*Does not include Platoon Headquarters 13T requirements.

Table 5.6-2 Total Personnel Incorporating Fractional MOS Consideration for Direct Suppo.'t (DS) Level

MOS	Reference Sustained	Reference O&O	Bas-line Sustained	Bas-line O&O
26B	2.0	2.0	0.4	0.4
26L	13.0	16.0	0.5	0.5
26T	10.0	12.0	-	-
31E	25.0	28.0	16.0	17.0
31J	10.0	10.0	2.0	2.0
31S	7.0	7.0	7.0	10.0
34Y	19.0	22.0	3.0	4.0
3[illegible]	3.0	5.0	1.0	1.0
35H	14.0	14.0	14.0	14.0
36H	3.0	3.0	3.0	3.0
41B	4.0	4.0	4.0	4.0
41C	0.4	0.4	0.4	0.4
43M	0.1	0.1	1.0	1.0
44B	6.0	7.0	6.0	7.0
45B	0.1	0.1	0.1	0.1
45G	17.0	24.0	-	-
52C	32.0	32.0	39.0	39.0
52D	18.0	20.0	15.0	17.0
63G	84.0	101.0	33.3	38.8
63J	0.3	0.3	0.3	0.3
63W	147.0	147.0	73.0	73.0

Table 5.6-3 Personnel Requirements by Paygrade
(Includes Platoon Headquarters Requirements)

	Reference		Baseline		
Grade	Sustained	3/2 Shift	Sustained	3/2 Shift	FQQPRI RPV Section
E-1	676.8	866.2	652.7	842.1	466.4
E-2	467.1	584.4	446.2	563.5	294.2
E-3	644.6	820.3	621.4	797.1	432.4
E-4	964.5	1,216.7	911.6	1,163.8	616.8
E-5	376.6	516.7	372.7	512.8	310.5
E-6	161.1	274.9	161.1	274.9	199.0
E-7	77.7	132.6	77.7	132.6	96.0
E-8	-	-	-	-	-
E-9	-	-	-	-	-
TOTAL	3,368.4	4,411.8	3,243.4	4,286.8	2,415.3

Table 5.6-4 Personnel Requirements by Paygrade
(Excludes Platoon Headquarters Requirements)

	Reference		Baseline		
Grade	Sustained	3/2 Shift	Sustained	3/2 Shift	FQQPRI RPV Section
1	534.7	724.1	510.6	700.0	450.6
2	379.0	496.4	358.1	475.5	284.4
3	512.8	688.5	489.6	665.3	417.8
4	775.3	1,027.5	722.4	974.6	595.8
5	271.4	411.6	267.5	407.7	298.8
6	151.7	189.6	151.7	189.6	189.6
7	73.2	91.5	73.2	91.5	91.5
8	-	-	-	-	-
9	-	-	-	-	-
TOTAL	2,698.1	3,629.2	2,573.1	3,504.2	2,328.5

SECTION 6 - CONDUCT IMPACT ANALYSIS

6.1 OVERVIEW

Impact Analysis determines the demand that an emerging system's personnel and training requirements will place upon the projected supply of personnel and training resources. This supply/demand assessment identifies a system's "high drivers", i.e., those factors related to design, personnel or training policy, maintenance plan or scenario, which would cause consumption of a disproportionate share of the available resources. Having determined these high resource drivers, they often become the focus for tradeoff analysis to identify alternative approaches to lessen their system impacts.

Impact Analysis for this iteration was conducted by taking advantage of a reasonable, simplifying assumption: RPV will, in essence, represent a complete addition to the Army's force structure (and hence manpower, personnel and training requirements). In other words, no Army system presently deployed will be replaced by RPV. The rationale of this assumption stems from the RPV's Organizational and Operational Concept, which indicates that the Army presently lacks the capability which RPV provides, thus establishing the RPV system requirements. The utility of this major assumption is elaborated upon in the following sections, which describe training and personnel impacts, respectively.

6.2 TRAINING IMPACTS

For a determination of training impacts, the assumption that the RPV will represent a complete force structure addition implies that existing training resources will be, and will remain, completely committed to Army training presently being conducted. Thus, the RPV training resource requirements, or demands, determined in Section 4 are completely "unfunded", and consequently the impacts of these demands are the demands themselves. It remains only to rank-order the training resource requirements (man-days and instructors) in descending order to determine their degree of impact. The results of this ranking are displayed in Tables 6.2-1 and 6.2-2.

6.3 PERSONNEL IMPACTS

6.3.1 Process

A comparison of the personnel demands of a new system to available personnel resources can indicate three conditions: (1) a surplus of resources relative to demand, (2) a shortage of resources, or (3) projected resources are adequate to meet demand. In Impact Analysis, the first condition is called a surplus, the second a shortfall, and the third condition is referred to as neutral.

Two types of personnel data, authorizations and availability, were used to make supply/demand comparison. Authorizations are those manpower positions, or spaces, for which the Army has received (or must request) funding authority from the Congress. Thus authorizations constitute

Table 6.2-1

Training Impacts: Man-Days

Rank Order	Reference: Sustained MOS	Reference: Sustained Man-Days	Reference: 3/2 Shift MOS	Reference: 3/2 Shift Man-Days	Baseline: Sustained MOS	Baseline: Sustained Man-Days	Baseline: 3/2 Shift MOS	Baseline: 3/2 Shift Man-Days
1	13T	27,392	13T	46,727	13T	24,545	13T	41,870
2	13TP9	8,998	13TP9	8,998	13TP9	6,003	52D	6,683
3	52D	5,645	52D	6,683	52D	5,645	13TP9	6,003
4	35H	5,191	35H	5,191	35H	5,191	35H	5,191
5	34Y	4,210	34Y	4,210	34Y	3,570	34Y	3,570
6	26L	3,526	26L	3,526	36H	3,374	36H	3,374
7	35E	3,385	35E	3,385	26L	3,306	26L	3,306
8	36H	3,374	36H	3,374	63G	3,278	63G	3,278
9	63B	3,278	63G	3,278	35E	2,920	35E	2,920
10	63W	2,932	63W	2,932	31E	2,577	31E	2,577
11	31E	2,633	31E	2,633	52C	2,532	52C	2,532
12	52C	2,532	52C	2,532	63W	2,295	63W	2,295
13	45G	2,362	45G	2,362	26B	1,828	26B	1,828
14	26B	1,828	26B	1,828	41C	1,797	41C	1,797
15	41C	1,797	41C	1,797	31S	1,463	31S	1,463
16	31S	1,463	31S	1,463	44B	1,421	44B	1,421
17	44B	1,421	44B	1,421	31J	1,375	31J	1,375
18	31J	1,375	31J	1,375	13T30	722	13T30	722
19	26T	821	26T	821	41B	533	41B	533
20	13T30	722	13T30	722	63J	482	63J	482
21	41B	533	41B	533	45B	336	45B	336
22	63J	482	63J	482	43M	314	43M	314
23	45B	336	45B	336	-	-	-	-
24	43M	314	43M	314	-	-	-	-

Table 6.2-2

Training Impacts: Instructors

	Reference				Baseline			
	Sustained		3/2 Shift		Sustained		3/2 Shift	
Order	MOS	Instructors	MOS	Instructors	MOS	Instructors	MOS	Instructors
1	13T	21.5	13T	36.6	13T	20.3	13T	34.6
2	13TP9	15.8	13TP9	15.8	13TP9	11.1	13TP9	11.1
3	34Y	8.5	34Y	8.5	34Y	7.6	34Y	7.6
4	52D	6.5	52D	7.5	52D	6.5	52D	7.5
5	26B	5.2	26B	5.2	26B	5.2	26B	5.2
6	63G	4.0	63G	4.0	63G	4.0	63G	4.0
7	52C	3.9	52C	3.9	52C	3.9	52C	3.9
8	26L	3.6	26L	3.6	26L	3.4	26L	3.4
9	35E	3.6	35E	3.6	35E	2.8	35E	2.8
10	45G	3.4	45G	3.4	35H	2.8	35H	2.8
11	63W	3.0	63W	3.0	36H	2.7	36H	2.7
12	35H	2.8	35H	2.8	63W	2.3	63W	2.3
13	36H	2.7	36H	2.7	41C	2.0	41C	2.0
14	41C	2.0	41C	2.0	31E	1.7	31E	1.7
15	31E	1.8	31E	1.8	31S	1.6	31S	1.6
16	31S	1.6	31S	1.6	31J	1.1	31J	1.1
17	31J	1.1	31J	1.1	44B	1.0	44B	1.0
18	44B	1.0	44B	1.0	45B	.9	45B	.9
19	45B	.9	45B	.9	13T30	.6	13T30	.6
20	26T	.8	26T	.8	41B	.6	41B	.6
21	13T30	.6	13T30	.6	63J	.6	63J	.6
22	41B	.6	41B	.6	43M	.4	43M	.4
23	63J	.6	63J	.6	-	-	-	-
24	43M	.4	43M	.4	-	-	-	-

a statement of the Army's demand for manpower. Availability, on the other hand, is a statement of the personnel system's ability to fill the authorized positions with individuals. In any current year, availability is a statement of personnel inventory on-hand. In a future year, it is an estimate of future supply. It must be noted that authorizations do not reflect the force structure required to satisfy the various missions with which the Army has been tasked. In peacetime, the Army chooses not to man (i.e., authorize) 100% of its units at 100% of their force structure requirement, in order to divert resources to other priority objectives. Consequently, authorizations are usually lower than requirements; stated another way, the manpower demand reflected by requirements is almost always higher than that reflected by authorizations. It is not possible to make an analysis of how an emerging system's manpower requirements impact on the total force structure requirements without knowing how force structure requirements are allocated to the various systems and MOS's. This information was not available for this RPV study.

It was, however, possible to determine the impact of RPV for a supply/demand comparison based on authorizations. RPV will represent a complete increase to present projections of both authorizations and availability, since it is also assumed that no systems will be replaced by RPV.[1] Therefore

[1] The new enlisted MOS required by RPV, 13TXX with ASIP9, RPV Crewmember and Mechanic, respectively, were assumed to impact upon, and therefore could be represented by, the existing MOS 15D. Their true availability ratios are zero, since these skills do not presently exist in the inventory. However, the impacts presented here represent the more realistic case, where RPV will draw its manpower from an existing pool such as the 15D MOS.

100% of the RPV specific manpower (i.e., force structure) requirement will be added to present authorizations. An availability ratio (AR) may now be calculated using the equation:

$$AR = \frac{\text{Availability}}{\text{Authorizations} + \text{RPV Manpower}}$$

where:

$AR < 1$	= Shortfall
$AR > 1$	= Surplus
$AR = 1$	= Neutral

Availability and authorization data, by MOS and paygrade, for fiscal year (FY) 1983 were provided from the Army's Personnel Policy Project Model (P^3M). This data was accepted as the "best estimate" on which to base near-term decisions regarding RPV. Further, the data were inflated to allow for the effect of the Trainees, Transients, Holdees and Students (TTHS) account. These figures had to be backed-out using the TTHS percentages from the Chief of Personnel Operations (COPO) 45 report. Thus the final equation was:

$$AR = \frac{(\text{Availability}) \times (1 - \%\ \text{TTHS})}{\text{Authorizations} \times (1 - \%\ \text{TTHS}) + \text{RPV Manpower}}$$

Adjusted availability and authorizations for the MOS's considered by the RPV study are displayed in Table 6.3-1. RPV manpower requirements are displayed in Table 6.3-2. Table 6.3-3 displays the Availability Ratio results. As an example of how to interpret the given AR values, the 13T MOS in Table 6.3-3 indicates that the potential source of the 13T MOS has a projected availability for FY-84 of 87%. The 0.69 in column 4 indicates that when the RPV demands for MOS 13T are placed on the personnel system, a 31% shortfall exists. The 0.21 in parenthesis for column 3 indicates that the AR demand in column 4 shows a load of 21% with respect to the column 2 FY84 AR projection. The following section describes the P^3M model and how availability and authorization were defined. For detailed information regarding the P^3M model and how specific availability and authorization considerations are defined, see DRC's initial RPV report, Volumes I and II, previously referenced.

6.4 MAINTENANCE IMPACTS

The addition of the FLIR payload package to the RPV system introduced some requirements for additional operator and maintenance tasks at the section level. The impact of this payload package upon the total workload requirements previously determined for the RPV section was minimal. This information is detailed in Sections 2 and 3.

However, because of the specific requirements for detailed and sophisticated maintenance tasks for the FLIR payload, consideration was given to the impact of the maintenance level at which these specific tasks were to be performed. While having little or no effect on the RPV section

Table 6.3-1. Adjusted Availability/Authorizations
FY 1984 Total MOS/Paygrade

MOS	Availability	Authorizations
13T	2,517.07	2,839.58
26B	152.22	185.77
26L	763.04	926.62
26T	235.12	261.95
31E	1,605.29	1,634.74
31J	1,713.18	1,891.23
31S	747.19	631.69
34Y	585.14	455.62
35E	527.37	529.06
35H	1,330.93	1,285.33
36H	1,339.13	1,586.42
41B	49.22	42.98
41C	514.32	546.12
43M	458.84	516.17
44B	1,540.48	1,436.45
45B	467.07	515.26
45G	356.30	310.74
52C	1,851.32	1,805.10
52D	3,143.56	3,314.69
63G	821.35	877.70
63J	1,006.13	1,312.64
63W	3,386.56	4,126.45

Table 6.3-2. RPV Manpower Requirements

	Reference		Baseline		
MOS	Sustained	3/2 Shift	Sustained	3/2 Shift	RPV FQQPRI Section
13T	700	840	702	840	756
13TP9	112	112	112	112	168
26B	14	14	14	14	
26L	14	14	14	14	
26T	14	14	-	-	
31E	14	14	14	14	
31J	14	14	14	14	
31S	14	14	14	14	
34Y	14	14	14	14	
35E	14	14	14	14	
35H	14	14	14	14	
36H	14	14	14	14	
41B	14	14	14	14	
41C	14	14	14	14	
43M	14	14	14	14	
44B	14	14	14	14	
45B	14	14	14	14	
45G	14	14	-	-	
52C	14	14	14	14	
52D	126	126	126	14	56
63G	14	14	14	14	
63J	14	14	14	14	
63W	42	42	28	28	

Table 6.3-3. Availability Ratio Results

	Current FY 84 Projection	Reference				Baseline			
		Sustained		3/2 Shift		Sustained		3/2 Shift	
13T	0.87	(.21)	.69	(.24)	.66	(.21)	.69	(.24)	.66
26B	0.82	(.07)	.76	(.07)	.76	(.07)	.76	(.07)	.76
26L	0.82	(.01)	.81	(.01)	.81	(.01)	.81	(.01)	.81
26T	0.90	(.06)	.85	(.06)	.85	(.00)	.90	(.00)	.90
31E	0.98	(.01)	.97	(.01)	.97	(.01)	.97	(.01)	.97
31J	0.91	(.01)	.90	(.01)	.90	(.01)	.90	(.01)	.90
31S	1.18	(.02)	1.16	(.02)	1.16	(.02)	1.16	(.02)	1.16
34Y	1.28	(.02)	1.25	(.02)	1.25	(.02)	1.25	(.02)	1.25
35E	.99	(.02)	.97	(.02)	.97	(.02)	.97	(.02)	.97
35H	1.04	(.02)	1.02	(.02)	1.02	(.02)	1.02	(.02)	1.02
36H	0.84	(.00)	.84	(.00)	.84	(.00)	.84	(.00)	.84
41B	1.15	(.25)	.86	(.25)	.86	(.25)	.86	(.25)	.86
41C	0.94	(.02)	.92	(.02)	.92	(.02)	.92	(.02)	.92
43M	0.89	(.03)	.86	(.03)	.86	(.03)	.86	(.03)	.86
44B	1.07	(.01)	1.06	(.01)	1.06	(.01)	1.06	(.01)	1.06
45B	0.91	(.03)	.88	(.03)	.88	(.03)	.88	(.03)	.88
45G	1.11	(.06)	1.06	(.06)	1.06	(.00)	1.11	(.00)	1.11
52C	1.03	(.01)	1.02	(.01)	1.02	(.01)	1.02	(.01)	1.02
52D	0.95	(.04)	.91	(.04)	.91	(.04)	.91	(.04)	.91
63G	0.94	(.02)	.92	(.02)	.92	(.02)	.92	(.02)	.92
63J	0.77	(.01)	.76	(.01)	.76	(.01)	.76	(.01)	.76
63W	0.82	(.01)	.81	(.01)	.81	(.00)	.82	(.00)	.82

workload, the level at which repair of the FLIR package would be accomplished does have an effect on the overall system supportability and thus ultimately effecting total system readiness and availability. Therefore, the prime maintenance impact associated with this study effort was the level at which maintenance/repair functions for the FLIR payload package are performed.

SECTION 7 - TRADEOFF ANALYSIS

7.1 IDENTIFY TRADEOFF ALTERNATIVES

As an integral step within the HARDMAN methodology, tradeoff analyses which assess design, personnel, training or logistics alternatives are normally conducted. These tradeoffs help to formulate solutions to excessive resource consumers and potential problems are identified during system impact analysis.

As the analysis of the RPV section operating with alternative mission payloads in a 24 hour per day scenario proceeded, numerous tradeoff candidates were considered. Of these, three likely tradeoff candidates within the scope of this study were recommended to the program office. These candidates included tradeoffs concerning operational scenario and support considerations.

Regarding the operational scenario, a tradeoff of the number of moves conducted by the RPV section within a 24 hour period and its impact on system human resource requirements was proposed. Concerning support considerations, two tradeoff alternatives were identified. The first involved an examination of the maintenance tasks associated with the FLIR mission payload subsystem (FMPS) and the level at which these maintenance tasks were performed. This alternative included consideration of maintenance actions at the crew/organizational, direct support (DS), general support (GS) and depot levels of maintenance.

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The second support consideration involved an examination of the requirement for a minimum delay time associated with unavoidable stoppage/breakdown of the 30KW generators that power the ground control station. Present specifications call for a 90 second maximum period of time within which one generator can stop and the other one be brought online. This requirement has direct impact upon the personnel who must operate and service the generator, specifically the Power Generation Equipment Repairers, MOS 52D. A tradeoff examination of the impact of this 90 second requirement upon the manpower requirements of the RPV section (as effects MOS 52D or other similarly trained personnel) was proposed.

After reviewing the three proposed tradeoff alternatives, the RPV Program Office decided that an examination of the maintenance tasks related to the FMPS should be conducted.

Emphasis of the tradeoff would be an examination of the direct support, general support and depot maintenance tasks associated with the FMPS. The results of this tradeoff are detailed in the following sections.

7.2 TRADEOFF OF SELECTED ALTERNATIVE

7.2.1 Scope of Analysis

In the design of modern weapon systems, adequate attention must be given to determine a weapon system's optimum level of repair (LOR) structure. The earlier in the acquisition process that LOR considerations are examined and planning commences, the greater the probability that the approved LOR decision for a given design will be optimal with respect to repair sources required. The final LOR structure identifies the repair location as well as the extent of maintenance tasks to be performed and resources necessary to support the repair process.

Consideration of all logistic and operational factors and alternatives must precede the LOR decision. Thus, such a decision can be ma.e an integral part of the system design process to ensure optimum logistic support at minimal cost. Ultimately, a specific design of a system or subsystem must be used to conduct a competent, in-depth repair-level analysis. However, the RPV FLIR mission payload subsystem (FMPS) procurement has not as yet reached the contractual stage of engineering development whereby a design has been selected.

In considering likely FLIR designs, potential commercial FLIR vendors provided design related information to DRC during the timeframe of this study. Additionally, FLIR systems which are presently in DoD inventories were examined with respect to the present level of repair considerations. Therefore, armed with information/data regarding both present and proposed FLIR systems, this examination of the support concepts that may be associated with a FLIR LOR analysis serves as a "first cut" at identifying and determining those factors that can influence the FLIR LOR decision.

It should be noted that other than a DoD data item description requirement (number DI-S-6169), titled Optimum Repair Level Analysis (ORLA) Report, there is no specific instructions for conducting an Army ORLA. For this reason, the Military Standard Level of Repair, MIL-STD-1390B (Navy), was used as a guideline for this analysis (Ref. 8).

7.2.2 Approach to Problem

The LOR considerations were initially approached from principally a non-economic LOR analysis since cost data were not readily available. Also, non-economic considerations sometime preempt the LOR choices available and should therefore precede an economic analysis. However, for this study pertinent economic analysis cost factors are also considered and a full qualitative and a limited quantitative assessment of their influence is made. This economic assessment is limited in the sense that the cost values are only representative of those that may be encountered rather than actual. Since this a comparative analysis, the results will be valid indicators of the respective cost of repair.

Table 7.2-1 summarizes the results of this first step in the LOR analysis of the FMPS. Specifically, the left hand column of Table 7.2-1 lists the factors that are of concern when reviewing LOR analysis considerations. The two columns labeled "Impact Potential" provide a judgemental determination of whether there is an influence on those factors by the FMPS when the LOR is changed.

Given that one or more of the line replaceable units (LRUs) of the FMPS has its designated LOR changed from the depot to the general support (GS) level or vice-versa, or from the GS to the direct support (DS) level or vice-versa; the "what if" question(s) posed in making the judgments were: (1) will the factors listed be impacted and (2) why and to what degree are these economic and non-economic factors influenced? Non-economic feasibility and relative cost were two principal criteria used when considering the degree of impact.

Table 7.2-1 LOR Analysis Considerations for FLIR MPS

	Impact Potential		Considerations of Importance
	Depot ↔ GS Level	Depot ↔ DS Level	
Non-Economic Factors, "Preemptive"			
Safety	Yes	Yes	Laser Safety Conditions
Manning	Yes	Yes	Workload shift may cause additional positions even though no significant manhours required
Human Factors			
(1) Special Skills	Yes	Yes	Special Test Equipment; sophisticated and new sensors
(2) Human Engineering	No	No	
(3) Life Support Engineering	No	No	
Technical Feasibility of Repair			
(1) Specialized Repair Facilities	Yes	Yes	Possible clean room conditions; need for special test equipment
(2) Training Requirements	Yes	Yes	See Special Skills
(3) Manpower Availability	Yes	Yes	Special Training or prerequisites may inhibit availability

Table 7.2-1 (Continued)

	Impact Potential		Considerations of Importance
	Depot ↔ GS Level	Depot ↔ DS Level	
Special Transportation Factors			
(1) Weight	No	No	End item is less than 60 lbs.
(2) Volume	No	No	End item specification requires a low volume.
(3) Susceptibility to Transportation Damage	Yes, but	Yes, but	Use of special containers is necessary regardless of LOR.
Economic Analysis Factors, "Cost"			
Support Equipment (SE)	Yes	Yes	DS and GS level will require special test and/or support equipment (potential high cost item)
Spares Inventory	Yes	Yes	Line Replaceable Units location will influence pipeline spares cost (high cost item)
Training	Yes	Yes	See Special Skills.
Transportation	Yes	Yes	Smaller components to transport as LOR shifts toward field, special containers may be necessary, however.
Inventory Storage Space	Yes	Yes	Containers and spares require suitable storage space.
Repair & SE Space	Yes	Yes	Requires special bench repair capability, particularly if a clean room is needed.

Table 7.2-1 (Continued)

	Impact Potential		Considerations of Importance
	Depot ↔ GS Level	Depot ↔ DS Level	
Labor	Yes	Yes	Not labor intensive therefore not a high manhour cost but could cause need for a position (See Manning).
Documentation	Yes	Yes	Not a high cost item in relation to spares and SE.

A "yes" answer indicates an impact of some nature when the LOR is changed. A "no" answer indicates no apparent impact. The cause or consideration that resulted in a particular impact finding, plus any comments regarding the degree of influence, are provided in the right hand column labeled "considerations of importance."

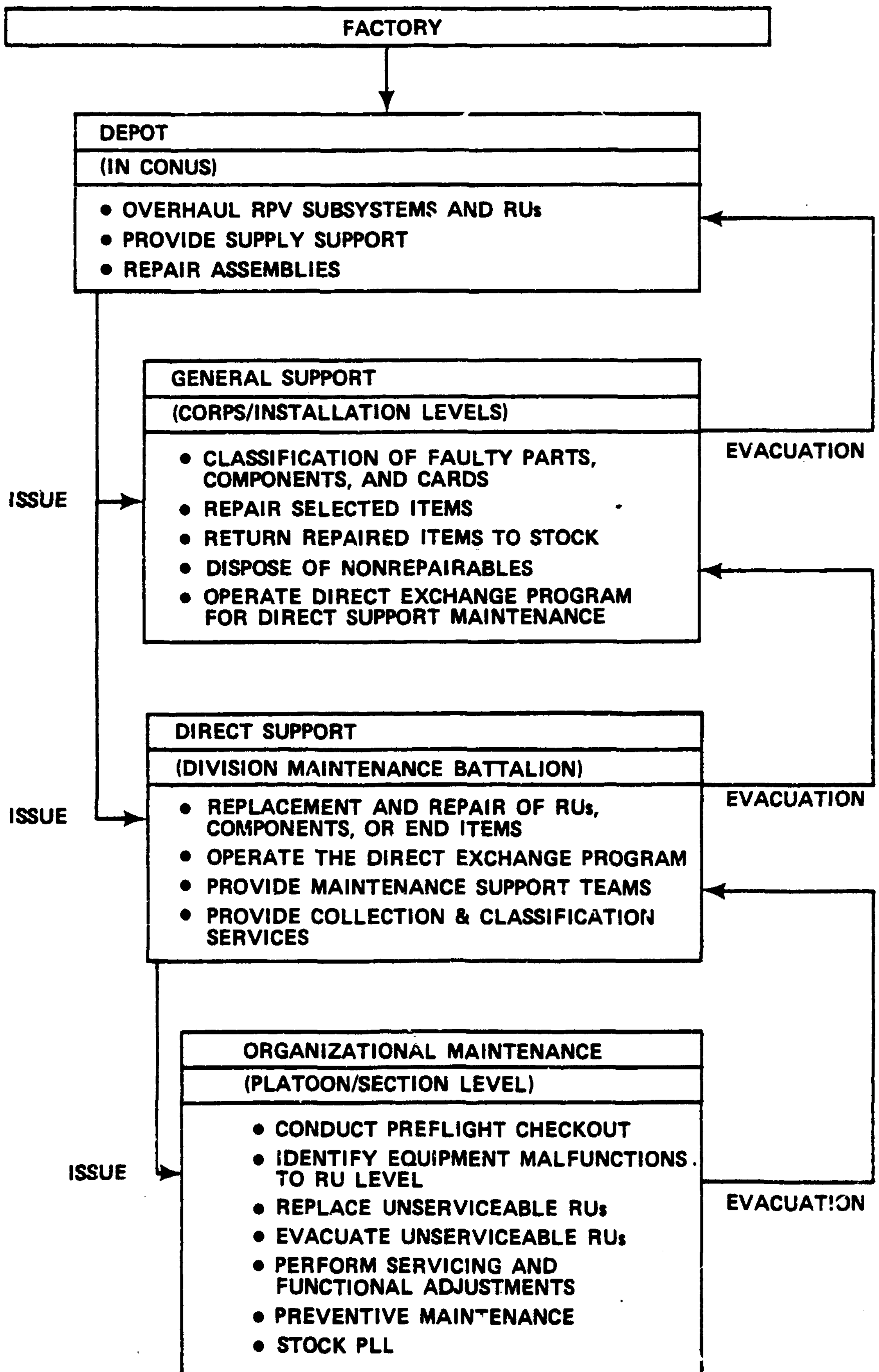
7.2.3 Technical Considerations/Assumptions

The FMPS is to be a modular replacement for the present TV equipped MPS (TVMPS). Therefore, the present RPV system maintenance concept was the frame of reference and the original TVMPS maintenance requirements served as an example of potential LOR capability when examining FMPS maintenance requirements. Figure 7.2-1 depicts th RPV system supply and maintenance concept as delineated by Lockheed Missile and Space Company's Integrated Logistic Support Plan (ILSP) (Ref. 7).

The following assumptions regarding test and repair and the logistic process requirements prevail in this analysis:

- o The FMPS will conform to the same four-level maintenance concept as the RPV system; namely, organizational, direct support (DS), general support (GS), and depot.
- o Depot level maintenance is fully capable of any type of repair regardless of lower level repair assignments.

Figure 7.2-1. Supply and Maintenance Concept for the RPV System



- Logistic support for equipment and material will be through normal Army supply and maintenance channels.

- No discards of assemblies or components take place below depot level.

The following list contains the general assumptions regarding cost elements and/or principal cost factors that are inherent in the DRC life cycle cost model which is titled the reliability, maintainability, and cost model (RMCM). Only the assumptions effecting this analysis are included.

- The model considers a uniform level of air vehicles at each operating site. (one GS maintenance element per site supporting one RPV platoon of four sections).

- The spares level and pipeline quantities are computed to support the peak level of system activity, peak flying hours, rather than any incremental buildup.

- The model explicitly computes only those logistics support costs associated with the system, subsystem, and line replaceable unit (LRU) indenture levels. Components below the LRU level (i.e., a shop replaceable unit (SRU)), are only implicitly considered by their relationship to a repair of a given LRU. For example, average costs of SRU spares are computed based on the failure rates of their respective LRUs.

- There are three levels of repair exclusive of condemnation: (1) on-equipment repair at the organizational level, (2) shop repair at the DS or GS level on-site, and (3) repair at the depot. From the on-site GS facility, only two levels can be exercised: repair at the GS or ship to the depot. The decision to ship failed LRUs to the depot is made at the GS level upon receipt and inspection of the equipment, and this probability is obtained from the R&M model. Items designated for depot repair provide the source of the LRUs and SRUs for condemnation (throw away). A one percent and five percent condemnation rate were selected for the LRUs and SRUs, respectively.

- Sites are assumed to be identical in the model with respect to maintenance manpower levels, consumables, and facilities.

- The recurring depot repair cost factors are predicated on average values of one centralized depot repair location.

- Sites are assumed to be identical with respect to environmental effects on equipment failure rates and logistics support.

- Inventories of spare LRUs are located at each of the sites consistent with the demand rate for LRUs at the sites and the variable depot-to-site resupply time-interval selected for use in the model. In addition, inventories are also located at the depot consistent with the appropriate LRU demand rates, resupply times, site repair-cycle time, and depot repair-cycle time selected for use in the model.

- Transportation costs may vary for the sites, but a representative average for overseas and CONUS sites is employed in the model for the LRU depot repairs.

- Forward supply points are not considere[illegible] the model. However, the transportation cos[illegible]epot repairables for overseas sites is computed in terms of the increased packing and shipping cost, and the proportion of forces overseas.

- The relationship established for determining the required quantities of shop support equipment (SE) assumes a manhour/machine hour equivalence. This SE demand time supposes that a given piece of SE is occupied during the elapsed time period equivalent to the mean time to perform a shop bench check task event. The downtime for repair of the SE test station is also accounted for when computing SE utilization.

- Maintenance personnel perform the direct maintenance manhours (DMMH) needed to meet the depot maintenance requirements of the deployed unit(s). The indirect maintenance labor attributable to supervisors, administrative, and supply personnel are accounted for through the indirect labor cost terms in the model.

- Training costs are computed according to the following concept: (1) initial training and training equipment costs are not considered, (2) recurring training costs for organizational and DS/GS personnel are based on average turnover rates for each MOS and (3) cost of recurring training for the cadre personnel other than depot are absorbed in their yearly salaries over the lifetime of the system. The recurring costs of training depot personnel are assumed to be in the overhead of depot level LRU repair.

- All costs input to the model are in constant-year, 1982 dollars.

- The reliability parameter values in the data bases are based on mean operating/flying hours between maintenance actions (MFHBMA). The maintenance actions inherent in the MFHBMA variable include those brought about by the FMPS being removed and shipped to the shop for repair and the remove-and-replace LRU actions. The remove actions are representative of the mean time between failure (MTBF) rate for the LRUs that are to be repaired.

- Maintenance costs are computed to include the costs of labor for both corrective (unscheduled) and preventive (scheduled) maintenance at the site level. Maintenance labor costs at the depot are contained in the average cost-per-depot-repair of an LRU.

- Some of the major cost values used, and associated assumptions are:

1. FMPS Production Cost/Subsystem = $125,000 (Ref. 2). The three lower level major assemblies were prorated to add up to the FMPS cost as follows:

   (a) Optical Turret Assembly = $46,800

   (b) Inner Gimbal Assembly = $57,200

   (c) Payload Support Assembly = $20,800

2. Unit cost of the next lower level replaceable assemblies were estimated. The average cost of the SRUs used in the repair process were calculated on the basis of how many of these SRUs are contained in the subassembly. This average SRU cost was multiplied by a factor of 1.5. This factor incorporates the consideration that the total costs of all subassembly parts (SRUs) when produced separately are greater than the cost of the subassembly itself.

3. Unit cost of each test station (support equipment (SE)) for the GS level is $130,000 including the $30,000 interface hardware to utilize existing test stations. One SE is required per GS site.

4. Unit cost of depot level SE is $200,000 per "test station". Two SE are required for the one depot site. However, four SE are required at the depot when the GS level is not performing maintenance to handle the additional load.

5. Depot repair cycle time is 34 days.

6. Base repair cycle time is 5 days.

7. Expected back order for spares is 0.1.

8. Number of GS sites is 14.

9. Number of AVs supported by a GS site is 20.

10. Half of the total force is deployed overseas.

11. Planned inventory usage period (Life Cycle) is 10 years.

7.2.4 FMPS Work Breakdown Structure

Section 2 describes the system engineering analysis portion of this study which resulted in the choice of a representative FMPS. Figure 2.2-1 pictorially displays the major assemblies of the FMPS. The equipment was identified to the level of indenture necessary to establish the reliability and maintainability characteristics suitable for obtaining workload. This was adequate for the organization and DS level maintenance study since the FMPS is replaced as a unit at the organization level and the DS level merely operates a direct exchange program for the FMPS. The faulty complete FMPS is then sent to the GS level for fault isolation and repair or disposition (e.g., return to depot).

However, to perform the LOR analysis, the equipment had to be identified to a lower level of indenture. The nomenclature of the work breakdown structure (WBS) of the FMPS design resulting from this analysis is listed in Table 7.2-2 along with the nomenclature of its replaceable units (RUs). An FMPS WBS block diagram is depicted in Figure 7.2-2 with the respective WBS number shown above each block. These are the replaceable assemblies (i.e., RUs). Included in Figure 7.2-2 is the suggested level of repair based on the non-economic analysis that served as the LOR reference system. This reference system represents a maintenance philosophy that is comparable to the daylight TVMPS. As noted in the Figure 7.2-2 key, a notation in the upper left hand corner of an assembly is the remove and replace level and in the lower right hand corner, the repair level. The notation for the four possible levels of repair actions are:

O = Organization
DS = Direct Support
GS = General Support
D = Depot

7.2.5 Non-economic Analysis

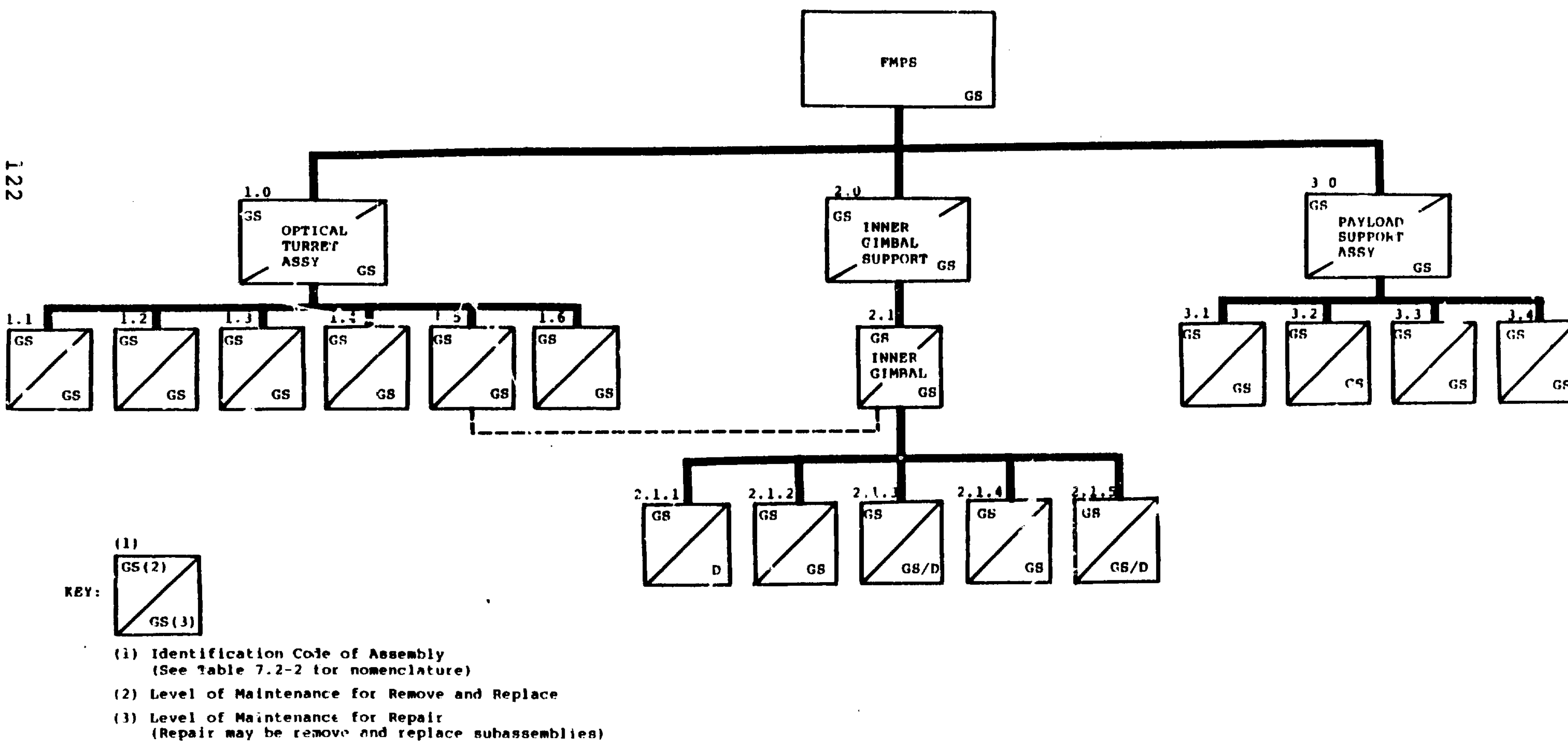
It will be noted that all the RU's are considered repairable at the GS level with the exception of the following units which are recommended as being depot repairable:

WBS	NOMENCLATURE	REPAIR LEVEL
1.1	Laser Transmitter	GS/D
1.6	Window Assembly	D
2.1.1	FLIR Receiver	D
2.1.3	Laser Range Receiver	GS/D
2.1.5	Gyro System	GS/D

Table 7.2-2 Work Breakdown Structure Nomenclature

ID CODE	NOMENCLATURE
1.0	Optical Turret Assembly
1.1	Laser Transmitter
1.2	Payload Processor Electronics
1.3	Turret Assembly
1.4	Outer Gimbal Drive System
1.5	Windscreen Assembly Outer Gimbal
1.6	Window Assembly
2.0	Inner Gimbal/Support
2.1	Inner Gimbal
2.1.1	FLIR Receiver
2.1.2	Inner Gimbal Drive System
2.1.3	Laser Range Receiver
2.1.4	Miscellaneous Motor/Drive Electronics
2.1.5	Gyro System (Stabilization Electronics)
3.0	Payload Support Assembly
3.1	Access Cover
3.2	System Power Supply
3.3	Slipring Assembly
3.4	Azimuth Drive System

Figure 7.2-2. FMPS Work Breakdown Structure Diagram



The laser transmitter, the laser ranger and the gyroscope system are shown as having a possibility of repair at the GS level. The principal restriction against GS level repair will be the availability of a suitable testing capability. The Army's AN/USM-410 Electronic Quality Assurance Test Equipment (EQUATE) will be required to allow sufficient test capability. However, the mission payload system, both TV and FLIR, are not compatible with the AN/USM-410 core (Ref. 9). For example, considerable electro-optic (E-O) augmentation is required because the present AN/USM-410 core system has no provision for mounting, stimulating or measuring the output of E-O sensor units.

The FLIR payload and the composite type of optics required for a window assembly are not compatible with the USM-410 core test capability and a clean-room atmosphere is recommended for their handling and repair. Since these optical units contain multiple lenses they must be handled with care when removed from the FMPS to avoid exceeding specified "G" limitations. Also, these units require an optical test table with special fixtures for functional testing. The sensor elements of the FLIR, as well as the optics, can be easily damaged and contaminated by an inadequate clean-room atmosphere. For these reasons, repair at intermediate levels of maintenance (DS or GS) seems highly unlikely.

DS-level repair was eliminated as a viable alternative for the foregoing reasons as well as for the costs associated with the requirement for three times the amount of test equipment without a compensating reduction in spares. This completed the non-economics portion of the analysis.

An economic analysis was then accomplished despite the limited availability of cost data. The rationale for the validity of the results is based upon the fact that the economic analysis involves comparability analysis of costs between the selected LOR alternatives. Therefore, as long as the costs are reasonable in respect to each other for a given alternative, use of those same costs for a second alternative will provide a valid comparison.

7.2.6 Economic Analysis

A DRC developed life cycle cost (LCC) model entitled the reliability, maintainability, and cost model (RMCM) was used to compare LOR alternatives (Ref. 10). The RMCM is an interactive accounting type model that accommodates all LCC parameters while providing maximum visibility into the operational and support (O&S) costs. The RMCM equations used were tailored to those LCC elements which are influenced by LOR considerations. Cost values not specific to LOR considerations were ignored. Therefore, there was no intent to obtain "bottom line" LCC values, but rather, to obtain O&S costs that could be compared to provide additional information for the LOR analyses.

The following elements were computed using constant 1982 dollar values:

CODE	LCC COST ELEMENT
Non-recurring costs:	
CPTI	Cost of Initial Maintenance Personnel Training
CSPI	Cost of Spares Investment
CDRI	Cost of Initial Depot Support Equipment
CSEI	Cost of Base Level Support Equipment Investment
CJGI	Cost of Initial Maintenance Manuals

CIMI	Cost of Initial Inventory Management

Recurring Costs:

COM	Cost of On-Equipment Maintenance (crew/organization)
CSM	Cost of Intermediate Shop Maintenance (DS/GS)
CPT	Cost of Maintenance Personnel Training
CSP	Cost of Replacement Spares
CDR	Cost of Depot Maintenance
CSE	Cost of Maintaining Support Equipment
CJG	Cost of Supporting Maintenance Manuals
CIM	Cost of Inventory Management

The LOR alternatives chosen to make the economic analyses were:

(1) The reference system as described in the previous section. This is principally GS level repair of RU's except for the FLIR, lasers, gyros, and optics which are repaired at the depot.

(2) Depot level maintenance for the three major assemblies, with only unit test and removal of these assemblies from the FMPS at GS level.

(3) GS level test and repair permissable for all assemblies. It should be noted that this may not be a viable alternative, as previously discussed, but provides a lower limit of cost associated with pipeline sparing. The cost of test equipment procurement will, however, increase.

The results of the LCC model runs for the three alternatives are shown in Table 7.2-3. The procurement cost is provided

Table 7.2-3 LCC Comparison of LOR Alternatives

Cost Element	LOR Alternative ($000) #1 GS/Depot Mix	#2 Depot	#3 GS
• Non-recurring (Initial) Costs:			
Maintenance Personnel Training	0	0	0
Spares Investment	5,896	13,885	3,215
Depot Support Equipment	440	880	440
Site Level Support Equipment	1,820	105	2,100
Maintenance Manuals	263	30	263
Inventory Management	42	9	42
• Total Non-recurring Costs (NRC)	8,461	14,909	6,060
• *NRC % of LCC (including procurement)*	7.8%	10.1%	10.1%
• Recurring (O&S) Costs:			
On-Equipment Maintenance	11,070	11,070	11,070
GS Level Shop Maintenance	1,142	627	1,880
Maintenance Personnel Training	293	274	320
Replacement Spares	4,538	4,538	4,538
Depot Maintenance	47,299	81,059	39
Maintain Support Equipment	560	28	560
Support Maintenance Manuals	99	11	99
Inventory Management	207	44	207
• Total Recurring Cost (RC)	65,208	97,651	18,713
• RC % of LCC (including procurement)	60%	66.2%	31.3%
• Total RC and NRC	73,669	112,560	24,773
• Procurement	34,944	34,944	34,944
• Total Computed LCC	108,613	147,504	59,717

in Table 7.2-3 to serve as a comparative value to the LOR involved cost elements. The estimated procurement costs of $34,944,000 is based on a system cost of $124,800 with a total force of 280 FMPS units. Integration, installation and delivery costs are not considered.

The GS/Depot repair alternative mix, although not the least costly, is the recommended alternative since it is also the most feasible with respect to non-economic parameters. The Depot repair alternative is the most costly due to cost of sparing major assemblies. The GS repair alternative although the probable least cost (the cost of modifying the SE may be substantially higher than estimated) is offset by the non-economic considerations. The facilities cost associated with providing a clean room capability would, also, have to be estimated. The cost differential to allow these considerations is theoretically $50,000,000 for this limited tradeoff study.

SECTION 8 - COMPARATIVE ANALYSIS AND RESULTS

This section contains a discussion of the results of this particular study and how they compare with findings of the initial RPV study. Based upon the results of this study recommendations for further actions are contained at the end of this section.

8.1 MAJOR DIFFERENCES BETWEEN THE 12 HOUR SCENARIO AND THE 24 HOUR SCENARIO

The initial MPT analysis of the Army RPV involved examination of the human resources supportability requirements for the RPV section operating in a 12 hour daylight scenario. Thus, tactical flight operations were confined to that 12 hour period. Additionally, only a single AV payload package (the TVMPS) was considered.

This study involved expanding the scenario to include around the clock operations, 24 hours-a-day. Additionally, an alternative or second mission-payload system was added for the AV. This was the FLIR subsystem. Therefore, not only did the operations envelope have to be expanded to consider impacts upon manpower requirements of this longer flying day but the operator and maintainer tasks associated with the additional FLIR equipment also had to be added.

Finally, during the period from completion of the first analysis until beginning the second analysis, additional information and documentation regarding the RPV system was received from the Program Office. This information included:

- The Final Qualitative and Quantitative Personnel Requirements Information (FQQPRI). This information added and deleted certain MOSs from the RPV section as well as the direct support maintenance elements used for the first RPV study.

- Basis of Issue Plan Feeder Data (BOIPFD). This information provided cost data on major RPV subsystems and was used extensively during the tradeoff analysis conducted during this study.

- Logistics Support Analysis Record (LSAR) summaries from Lockheed Missile and Space Company. These summaries were significantly more complete than the LSAR's used during the initial study. While only 30% of the contractor's LSA was completed by workload for the first study, approximately 70% of the LSA was completed for this study. However, Lockheed's LSAR summaries reflected only daytime operation and did not include any FLIR/nighttime operator and maintainer tasks.

- Scenario data necessary to completely define the RPV sections operation during a 24 hour period. In places where this data was not complete, DRC analysts coordinated with RPV Program Office personnel to define parameters necessary to complete this study.

- Course material and programs of instruction previously requested but not available for use during the initial study. Receipt of this material allowed an update of proposed training requirements and more accurately reflected training information used in the reference system.

Based upon those major data sources listed above, along with other study information, the RPV Consolidated Data Base (CDB) was updated and configured for the 24 hour scenario alternative payload analysis. It should be noted that expanding the initial analysis from a 12 hour scenario to a 24 hour scenario does not involve simply multiplying results of the first study by a factor of two. While this may seem obvious, more importantly is the fact that some major changes in the grade and MOS structure of the RPV section occurred, as well as the equipment change resulting from adding the FLIR. Additonally, the 26B MOS Weapons Support Radar Repairer was added at the direct support maintenance level. Thus, these factors were all considered as part of this follow on study.

8.2 COMPARATIVE MANPOWER PERSONNEL AND TRAINING

Comparisons of results between the two studies will concentrate on the areas of manpower, personnel and training requirements. While each study contained impact and tradeoff analyses, these assessments were peculiar to the specific study and as such, offer no real basis for comparison.

8.2.1 Manpower Requirements

Shown in Tables 8.2-1 through 8.2-4 are the manpower requirements of the baseline and reference systems for the RPV section under the 12 hour scenario. These results are

TABLE 8.2-1 (12 Hour Scenario)
MANPOWER REQUIREMENTS, BASELINE SYSTEM
O&O CONCEPT*

MOS	ASI	PAYGRADE	RPV SECTION	RPV PLATOON	ARMY TOTAL
211B		WO	1	4	56
13T30		E6	1	4	56
13T20		E5	2	8	112
13T10		E4	2	8	112
13T10		E3	3	12	168
13T10		E2	2	8	112
13T20	P9	E5	1	4	56
13T10	P9	E4	1	4	56
63B10		E4	1	4	56
TOTAL			14	56	784

* RPV Platoon Headquarters Requirements are not included in this table.

TABLE 8.2-2 (12 Hour Scenario)
MANPOWER REQUIREMENTS, BASELINE SYSTEM
SUSTAINED CONCEPT *

MOS	ASI	PAYGRADE	RPV SECTION	RPV PLATOON	ARMY TOTAL
211B		WO	1	4	56
13T30		E6	1	4	56
13T20		E5	2	8	112
13T10		E4	2	8	112
13T10		E3	3	12	168
13T10		E2	1	4	56
13T20	P9	E5	1	4	56
13T10	P9	E4	1	4	56
63B		E4	1	4	56
TOTAL			13	52	728*

* RPV Platoon Headquarters Requirements are not included in this table.

TABLE 8.2-3 (12 Hour Scenario)

MANPOWER REQUIREMENTS, REFERENCE SYSTEM

O&O CONCEPT *

MOS	ASI	PAYGRADE	RPV SECTION	RPV PLATOON	ARMY TOTAL
211B		WO	1	4	56
13T30		E6	1	4	56
13T20		E5	2	8	112
13T10		E4	2	8	112
13T10		E3	3	12	168
13T10		E2	2	8	112
13T10	P9	E5	1	4	56
13T10	P9	E4	1	4	56
31V10		E4	1	4	56
63B10		E4	1	4	56
TOTAL			15	60	840

* RPV Platoon Headquarters Requirements are not included in this table.

TABLE 8.2-4 (72 Hour Scenario)

MANPOWER REQUIREMENTS, REFERENCE SYSTEM

SUSTAINED CONCEPT *

MOS	ASI	PAYGRADE	RPV SECTION	RPV PLATOON	ARMY TOTAL
211B		WO	1	4	56
13T30		E6	1	4	56
13T20		E5	2	8	112
13T10		E4	2	8	112
13T10		E3	3	12	168
13T10		E2	1	4	56
13T20	P9	E5	1	4	56
13T10	P9	E4	1	4	56
31V10		E4	1	4	56
63B10		E4	1	4	56
TOTAL			14	56	784

* RPV Platoon Headquarters Requirements are not included in this table.

driven exclusively by operator and maintainer workload requirements. Therefore, equipments for each configuration expressly defined the operator and maintainer tasks, and thus the workload each section position had to accomplish.

The manpower requirements for the 24 hour scenario are shown in Table 8.2-5. These requirements, unlike those of the 12 hour scenario, are driven by contingency manning considerations. Contingency manning dictates that all positions of the RPV section be manned on an around-the-clock basis. Therefore, strict workload considerations no longer are the main factor in determining section positions.

Finally, the section workload distribution is shown for the two scenarios in Figure 8.2-1 through 8.2-4. Figures 8.2-1 and 8.2-2 apply to the 12 hour scenario while Figures 8.2-3 and 8.2-4 apply to the 24 hour scenario. It can be seen that there are two main differences in these studies. Operational Manning (OM) for the 12 hour scenario consumed about 65% of the sections total workload. OM workload for the 24 hour scenario totaled approximately 78%. This large increase is directly related to the increase in flight operations and its associated supporting activities. Additionally, Preventive Maintenance (PM) and Corrective Maintenance (CM) workload decreases from 17% and 4%, respectively, for the 12 hour scenario to 14% and 2%, respectively, for the 24 hour scenario. This decrease is attributable to the fact that the 63B Wheeled Vehicle Mechanic has been moved from the section level to the organizational supporting unit. Thus, the workload associated with this position also shifts to the organizational support unit.

Table 8.2-5

RPV Section Manpower Requirements Summary by Crew Position for 24 Hour - FLIR Operations

CREW POSITION	MOS/SI ASI	PAYGRADE	WORKLOAD POSITIONS O&O	WORKLOAD POSITIONS SUSTAINED	OPERATOR POSITIONS FQQPRI[1]	THREE SHIFTS[1]	3 SHIFT GCS[1] 2 SHIFT OUTSIDE	3 SHIFT GCS[1] 2 SHIFT OUTSIDE SHARED POSITION
Mission	211B0	WO	1	1	1	1	1	1
Commander	13T40	E7	1	1	1	1	1	1
	13T30	E6	1	1	1	1	1	1
Air Vehicle	13T20	E5	1	1	1	1	1	1
Operator	13T10	E4	1	1	1	1	1	1
	13T10	E4	1	1	1	1	1	1
Mission	13T10	E4	1	1	1 (E5)	1	1	1 + 4 hr. L/R Team
Payload	13T10	E3	1	1	1	1	1	1 + 4 hr. L/R Team
Operator	13T10	E3	1	1	1	1	1	1 + 4 hr. L/R Team
Generator	52D10	E4	1	1	1	1	1	1
Operator	52D10	E2	1[2]	1[2]	0	1	1	1
	52D10	E2	0	0	0	1	0	0
Launch/	13T30	E6	1	1	1	1	1	1
Recovery	13T20	E5	1	1	1	1	1	1
Team Leader	13T20 P9	E5	1	1	1	1	(see L/R Team)	(see L/R Team)
Launch/	13T10 P9	E4	1	1	1	1	1	1
Recovery	13T10	E3	1	1	1	1	1	1
Team #1	13T10	E3	1	0	1	1	1	1
	13T10	E2	1	1	1	1	1	1
Launch	13T10	E4	0	0	1	1	1	1
Recovery					(13T10 P9)		(13T20 P9)	(13T20 F9)
Team #2	13T10	E3	0	0	0	1	1	*GCS Operators Shared Position
	13T10	E3	0	0	0	1	1	1
	13T10	E2	0	0	0	1	1	1
Launch	13T10	E4	0	0	0	1	0	0
Recovery	13T10	E3	0	0	0	1	0	0
Team #3	13T10	E3	0	0	0	1	0	0
	13T10	E2	0	0	0	1	0	0
TOTAL			18	17	18	27	21[3]	20[3]

Table 8.2.5 (Continued)

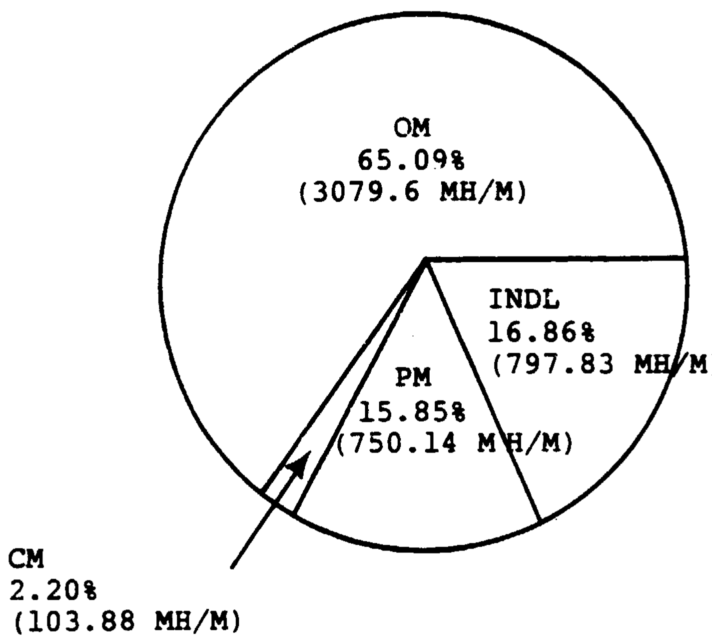
NOTE: (1) There is no difference in operator shift position requirements between O&O and sustained scenarios as they both cover 24 hour periods.

(2) Decision not to include a third 52D position assumes the 13T10 is capable of manning the generator operation station part time with a minimum of on-the-job-training (OJT).

(3) Allows for availability of vehicle drivers to make resupply, site survey and RPV briefing trips offsite.

Figure 8.2-1 RPV Section Workload Distribution
(12 Hour Scenario)

BASELINE - O&O SCENARIO



BASELINE - SUSTAINED

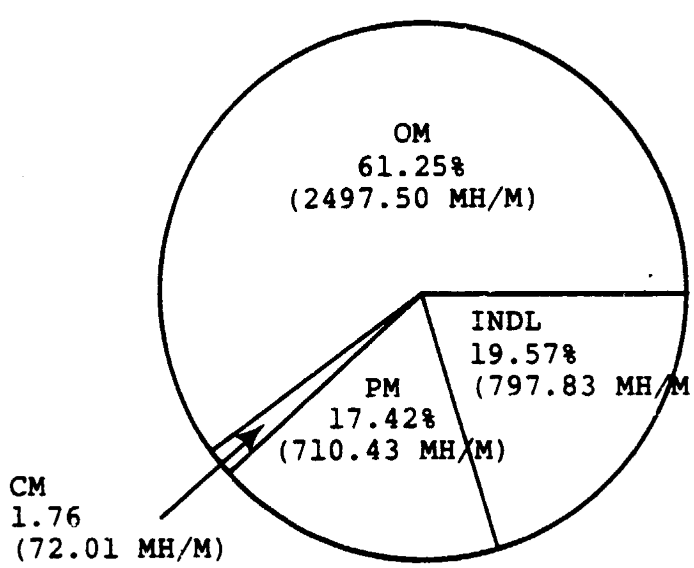
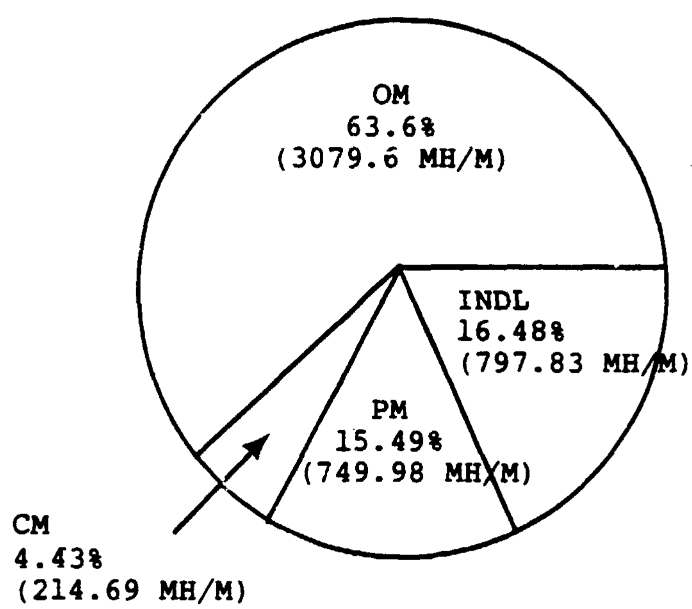


Figure 8.2-2 RPV Section Workload Distribution
(12 Hour Scenario)

REFERENCE - O&O SCENARIO



REFERENCE - SUSTAINED SCENARIO

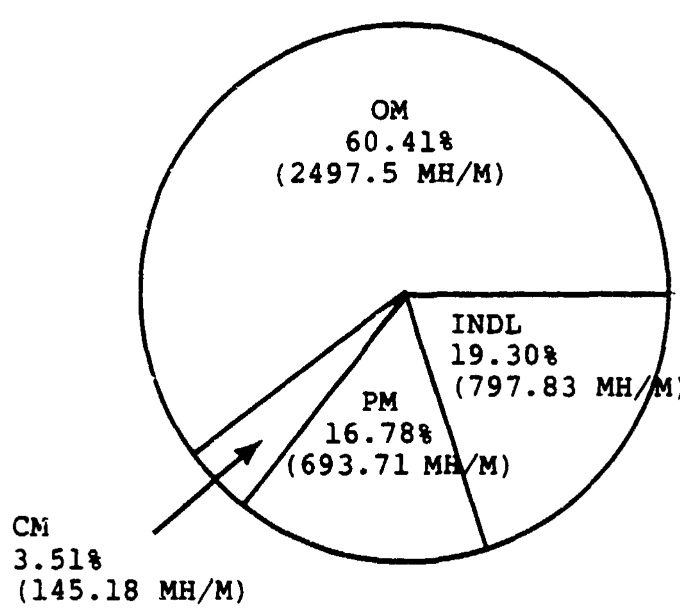
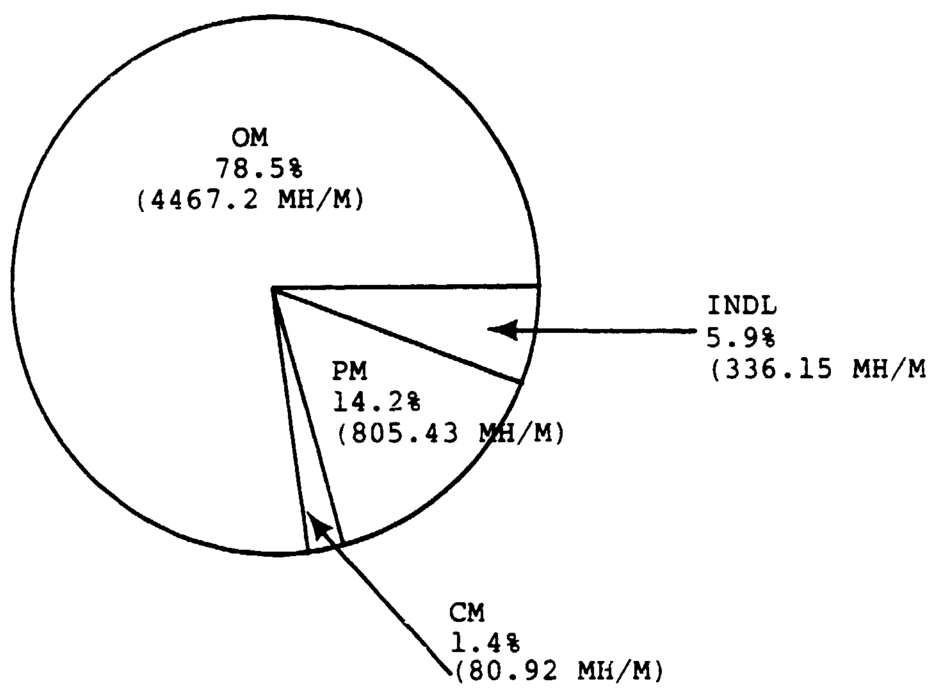


Figure 8.2-3 RFV Section Workload Distribution
(24 Hour Scenario)

BASELINE - O&O SCENARIO



BASELINE - SUSTAINED

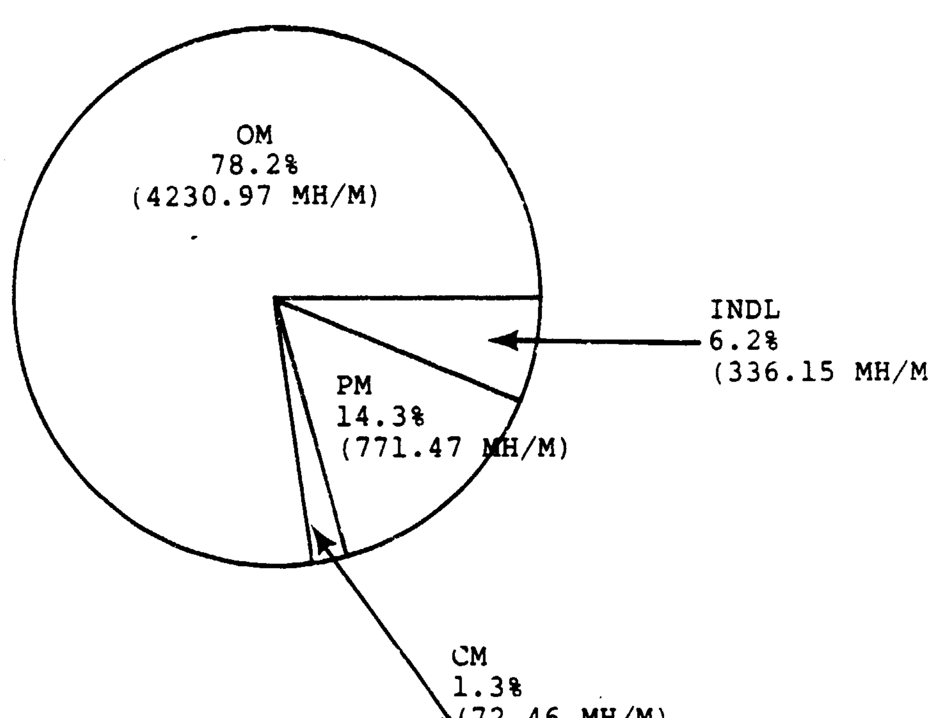
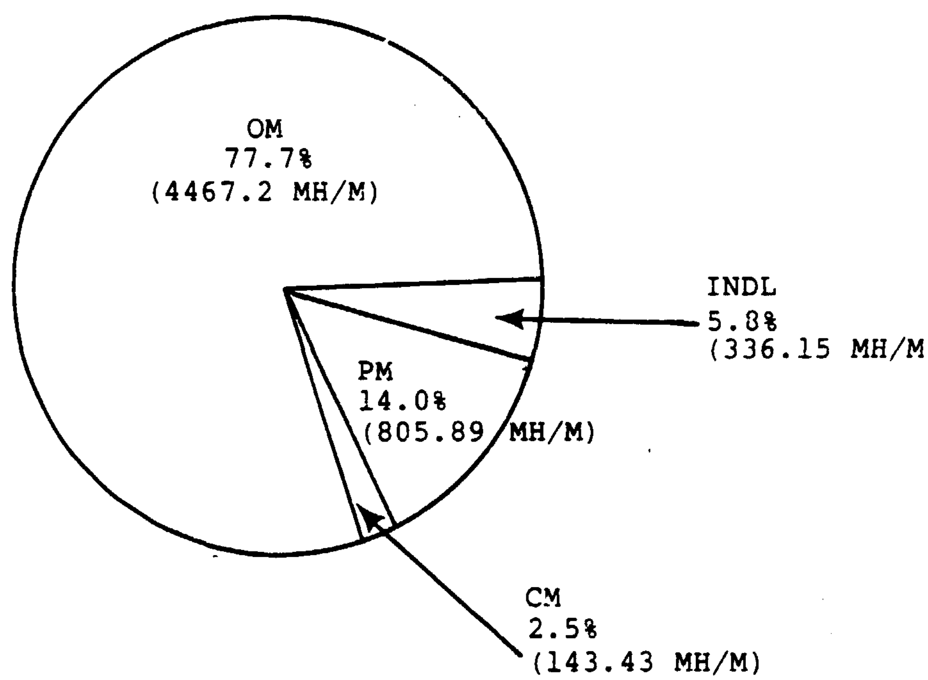
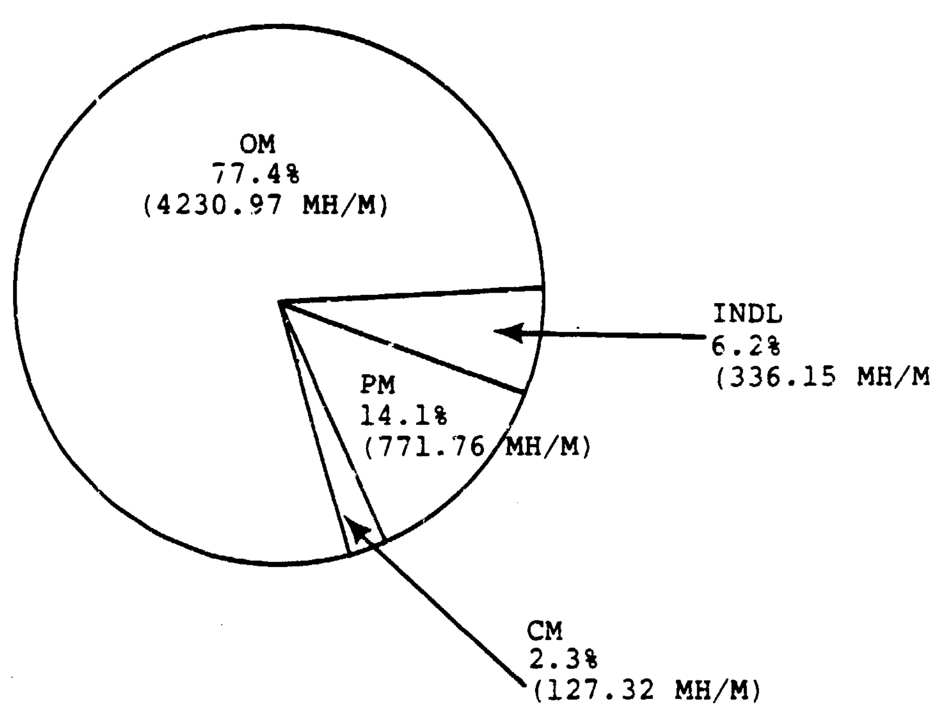


Figure 8.2-4
RPV Section Workload Distribution
(24 Hour Scenario)

REFERENCE - O&O SCENARIO



REFERENCE - SUSTAINED



8.2.2 Personnel Requirements

A comparison of the personnel requirements of the RPV system including the platoon headquarters personnel, is shown in Tables 8.2-6 and 8.2-7 for the 12 hour and 24 hour scenarios, respectively. As can be seen, a large increase (145%) in personnel requirements for the 24 hour scenario occurs. This is primarily due to two main factors. First, the contingency manning requirement of the 24 hour scenario dictates that a greater number of positions will be found at the section level. However, another significant reason as to why personnel requirements increase so dramatically lies in the fact that an E7, 13T40, was added to each RPV section by the FQQPRI. Thus many personnel are required in the pipeline to "grow" this E7. However, the addition of the E7 is very beneficial since it greatly reduces much of the skill overload considerations which were present during the first study. (Skill overload involves lower skill level personnel being required to perform higher level skills.)

8.2.3 Training Requirements

The impact of the 24 hour scenario on training will result in the addition of only three hours of training to the entry level operator course (XXX-13T10) and no addition of training to the organization and direct support echelon maintenance courses. This is the result of adding only the FLIR equipment itself to the previous RPV system configuration. Therefore, the effect of changing from a 12 hour to a 24 hour scenario is minimal with respect to training.

Table 8.2-6 Personnel Requirements by MOS (12 Hour Scenario)
(Includes Platoon Headquarters Requirements)

	Reference		Baseline	
MOS	Sustained	O&O	Sustained	O&O
13T	1,043	1,177	1,043	1,177
13T*	989	991	989	991
13T P9	360	360	360	360
26L	59	59	59	59
26T	31	31	-	-
31E	44	44	44	44
31J	34	34	34	34
31S	51	51	51	51
31V	176	176	-	-
34Y	97	97	97	97
35E	90	90	90	90
35H	82	82	82	82
36H	42	42	42	42
41B	42	42	42	42
41C	44	44	44	44
43M	27	27	27	27
44B	69	69	69	69
45B	27	27	27	27
45G	47	47	-	-
52C	125	125	125	125
52D	46	46	46	46
63B	139	139	139	139
63G	111	111	49	49
63J	31	31	31	31
63W	115	115	115	115

* Does not include Platoon Headquarters 13T requirements.

Table 8.2-7. Personnel Requirements by MOS (24 Hour Scenario)
(Includes Platoon Headquarters Requirements)

	Reference		Baseline		
MOS	Sustained	3/2 Shift	Sustained	3/2 Shift	FCOPRI RPV Section
13T	1478	2522	1478	2522	1826
13T*	1391	2435	1391	2435	1739
13TP9	360	360	360	360	40
26B	39	39	39	39	
26L	59	59	59	59	
26T	31	31	-	-	
31E	44	44	44	44	
31J	34	34	34	34	
31S	51	51	51	51	
34Y	97	97	97	97	
35E	90	90	90	90	
35H	82	82	82	82	
36H	43	43	43	43	
41B	42	42	42	42	
41C	44	44	44	44	
43M	27	27	27	27	
44B	69	69	69	69	
45B	27	27	27	27	
45G	47	47	-	-	
52C	125	125	125	125	
52D	247	293	247	293	182
63G	111	111	111	111	
63J	31	31	31	31	
63W	147	147	115	115	

*Does not include Platoon Headquarters 13T requirements.

Changes resulting from the FQQPRI updating, however, are quite significant. The RPV Warrant Officer (211B) will require the addition of 475.5 hours of maintenance training in the reference system and 332.9 additional hours in the baseline system. This will accommodate his now-required maintenance instruction. Use of built-in-test (BIT) equipment provides the larger difference in training course length.

The FQQPRI also requires the addition of one new direct support MOS, Weapons Support Radar Repairer (26B). Training of maintenance tasks to support new FLIR equipment will require an additional 1.5 mandays of training for this MOS.

8.3 RESULTS

The thrust of this study concentrated on the human resource requirements of the RPV section. Important considerations involved an operational scenario which covered an entire 24 hour period, as well as the additional equipment necessary to support around-the-clock operations. This additional equipment consisted of the FMPS.

Table 8.3-1 presents the results of the study with respect to the reference and baseline systems analyzed for the RPV. Some of the more specific results are contained in the following paragraphs, and were discussed in greater detail in the appropriate section of this report.

Mission

- o The equipment which defines the baseline RPV section is adequate to perform those target

Table 8.3-1. RPV System Summary

MANPOWER

Level	Tempo	Requirements		
		Section	Platoon	Army
Crew	Workload Driven			
	• O&O	18	72	1008
	• Sustained	17	68	952
	Contingency Manning			
	• 3 Shift	27	108	1512
	• 2 Outside/ 3 Inside	21	44	616
	• 3/2 Shift	20	40	560
	FQQPRI	18	72	1008
Direct Support	Baseline	-	20	280
	Reference	-	23	322

PERSONNEL

	Reference System		Baseline System	
	Sustained	3/2 Shift	Sustained	3/2 Shift
Number of MOS	23	23	21	21
Personnel Requirement*	3,325	4,361	3,216	4,305
Annual Recruit Rate	1,243	1,590	1,200	1,546

TRAINING

Annual Training Man-Days	86,550	106,923	75,507	93,870
Annual Instructor Requirements	95.9	112.0	83.1	98.4

*Includes Platoon Headquarters Personnel acquisition missions assigned to the RPV section operating in a 24 hour-a-day configuration.

System Analysis

- FQQPRI changes of moving corrective maintenance (CM) requirements to an organizational support unit transfer significant maintenance workload to that supporting unit.

Manpower

- Optimal manning for the 24 hour-a-day scenario is three shifts in the GCS and two shifts outside the GCS with outside workload shared between GCS and outside personnel (3/2 shifts). This contingency manning alternative requires 20 positions.

- Manpower requirements of the RPV system operating around the clock are driven more by contingency manning requirements than by workload considerations.

Personnel

- The 13T10 MOS availability for the RPV system projects a 31% personnel shortfall at IOC (based on FY 1984 estimates).

Training

- The requirement exists for both a system specific organizational maintenance MOS (rather than ASI P9) and a direct support maintenance MOS. This is based on the amount of training required by the P9 and the criticality of built-in-test (BIT) to perform to design specifications.

- The FQQPRI addition of the 13T40 at the section level greatly reduces the RPV skill overload which previously existed.

Impact

- RPV manpower requirements at IOC include MOS's already projected using Fiscal 1984 estimates to be in short supply. Among the most critical of these are:

MOS	Shortfall
13T	31%
26B	24%
63J	24%
26L	19%
63W	19%

Tradeoffs

The tradeoff selected was an examination of the maintenance tasks associated with a the FLIR mission payload subsystem (FMPS) at the direct support (DS), general support (GS), and depot maintenance levels. The tradeoffs, thus, became a level of repair (LOR) analysis for the FMPS. Both a non-economic and an economic LOR analysis were conducted. Results indicate that a GS/Depot repair mix is the recommended alternative although not necessarily the least cost.

8.4 CONCLUSIONS AND RECOMMENDATIONS

The RPV section, while operating in a 24 hour-a-day scenario and utilizing both TVMPS and FMPS payload packages, is optimally manned if operated with 3 shifts in the GCS and 2 shifts outside the GCS with outside workload shared. This manning configuration requires a total of 20 personnel at the section level, bringing each section position to 81% of workload capacity. Hence, the configuration best satisfies all workload and contingency manning requirements.

Based upon the study's results and above conclusion, a number of recommendations are made. First, a manpower, personnel and training and requirements assessment of an RPV section deployed in the central launch configuration (ground control station and remote ground terminal forward and support elements such as Launcher Subsystem, Recovery Subsystem, and associated handling and maintenance equipment in the rear area) should be conducted. The initial DRC study identified the possibility that workload associated with maintenance actions at the section level could be incorporated, or shifted, into existing direct support positions, or better performed in a rear area. This present study identified all operator and maintainer tasks associated with a 24 hour-a-day operation utilizing FMPS and TVMPS. The proposed investigation could also include a sensitivity analysis regarding the level at which operational and maintenance workload associated with this central launch concept is performed. This level of repair analysis should include depot level maintenance considerations.

Second, a detailed Training Resource Requirements Analysis (TRRA) should be performed to evaluate the training required by the 13TXX MOS and 13TXXP9 MOS. Having already identified the tasks and equipment necessary for the RPV MOS 13TXX personnel to perform their duties, a detailed TRRA would provide the interface between the task requirements of operators and maintainers and proposed simulators and training devices. A detailed TRRA, by developing the necessary courses of instruction for the RPV operators and maintainers, would greatly assist in finalizing the RPV Army Training Plan.

Third, an assessment of the operation of the RPV section, deployed in a nuclear, biological and chemical (NBC) environment should be conducted. Such an analysis would verify time to perform designated operator and maintainer tasks as well as determine the effectiveness of operating under NBC conditions. Additionally, as an integral part of the assessment, a human factors analysis of the ground control station should be performed. Operating within this controlled environment for extended periods of time would be key to the overall NBC evaluation.

BIBLIOGRAPHY/REFERENCES

Upwards of 280 documents have been compiled in the library portion of DRC's consolidated data base concerning remotely piloted vehicle (RPV) technology. Most of these documents were listed in the bibliography for the previous RPV study. In the interest of brevity, the only documents listed below are those that provided significant information for this study and are major references, i.e., those sources contributing directly to this front-end analysis technology.

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4. Logistics Support Analysis Record -- Personnel Skill Summary LSA-02. LMSC-L037666C, Lockheed, June 1983.

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11. Braman, K.J., Steward, W.B., System Configuration Tradeoff Analysis for Army Mini-RPV program. ARINC January 1977.

GLOSSARY OF DEFINITIONS/ACRONYMS

DEFINITIONS

Reference System: The reference system is a notional design configured to approximate a proposed major system or subsystem. The reference system meets mission/programmatic requirements specified for the proposed system in its Justification for Major System New Start (JMSMS) and/or Operational Requirement. The reference system is a composite of hardware and software components selected from current DoD/NATO inventories. Wherever possible, selected equipment should be mature so as to have reliability maintainability, operating hour, and manhour data available for analysis.

Baseline System: Like the reference system, the baseline system is a notional design configured to approximate a proposed major system or subsystems. The baseline system also meets mission/programmatic requirements specified for the proposed system in its JMSNS and/or Operational Requirement and is described in terms of its constituent hardware/software components. However, the baseline system can also include modified, improved, or new design features reflecting technological advances available before the proposed system's IOC. Thus, unlike the reference system, the baseline system can incorporate subsystems for which only laboratory or test data are available.

ACRONYMS

AFM	Air Force Manual
AFREG	Air Force Regulation
AIT	Advanced Individual Training
AR	Army Regulation
AR	Availability Ratio
ASI	Additional Skill Indicator
ASARC	Army System Acquisition Review Council
AV	Air Vehicle
AVIM	Aviation Intermediate Maintenance
AVUM	Aviation Unit Maintenance
BIT	Built-in-test
BOIP	Basis of Issue Plan
BOIPFD	Basis of Issue Plan Feeder Data
BTC	Basic Training Course
CDB	Consolidated Data Base
CFE	Contractor Furnished Equipment
CM	Corrective Maintenance
COI	Course of Instruction
COPO	Chief of Personnel Operations
COTR	Contract Office Technical Representative
DMDC	Defense Manpower Data Center
DoD	Department of Defense
DRC	Dynamics Research Corporation

DS	Direct Support
DT/OT	Development Test/Operational Test
ECMF	Enlisted Career Management Field
EMF	Enlisted Master File
FEAT	Front End Analysis Technology
FLIR	Forward Looking Infrared
FM	Failure Mode
FMECA	Forward Modes Effects Criticality Analysis
FMPS	FLIR Mission Payload Subsystem
FQQPRI	Final Qualitative and Quantitative Personnel Requirements Information
FY	Fiscal Year
GCS	Ground Control Station
GFE	Government Furnished Equipment
HQ	Headquarters
ILSP	Integrated Logistic Support Plan
IMAGES	Interactive Manpower Aggregation Estimation System
IMPACT	Interactive Manpower-Personnel Assessment and Correlation Technology
INDL	Indirect Labor
IOC	Initial Operational Capability
JMSNS	Justification for Major System New Start
JPL	Jet Propulsion Laboratory
KW	Kilowatt
LCN	Logistic Control Number

LOR	Level of Repair
LS	Launcher Subsystem
LSA	Logistic Support Analysis
LSAR	Logistic Support Analysis Record
MAA	Mission Area Analysis
MAC	Maintenance Allocation Chart
MACRIT	Manpower Authorization Criteria
MEP	Mission Event Profile
MH	Manhour
MILPERCEN	U.S. Army Military Personnel Center
MOS	Military Occupational Specialty
MPT	Manpower, Personnel and Training
MRA	Manpower Requirements Analysis
MRC	Maintenance Requirements Card
MTTR	Mean Time to Repair
MS	Maintenance Shelter
NAMSO	Navy Maintenance Support Office
NATO	North Atlantic Treaty Organization
NCOES	Non Commissioned Officer Education System
NETP	New Equipment Training Plan
O&O	Organizational and Operational
OICTP	Outline of Individual and Collective Training Plan
OM	Operational Manning
OP-AUDIT	Operational Audit

OPNAVINST	Chief of Naval Operations Instruction
OT	Operational Test
PERSACS	Personnel Structure and Composition System
PM	Preventive Maintenance
PMCS	Preventive Maintenance Checks and Services
PM	Project Manager
POI	Program of Instruction
PRA	Personnel Requirements Analysis
P3M	Personnel Policy Project Model
QQPRI	Qualitative and Quantitative Personnel Requirements Information
RAM	Reliability, Availability, and Maintainability
R&M	Reliability and Maintainability
RGT	Remote Ground Terminal
ROC	Required Operational Capability
RPV	Remotely Piloted Vehicle
RS	Recovery System
SDC	Sample Data Collection
SOJT	Supervised On-the-Job Training
TAB	Target Acquisition Battery
TM	Technical Manual
TRADOC	U.S. Army Training and Doctrine Command
TRRA	Training Resource Requirements Analysis

TTHS	Trainees, Transients, Holdees and Students
TVMPS	Television Mission Payload Subsystem
WQEC	Weapon Quality Engineering Center
WSAP	Weapon System Acquisition Process
3-M	Maintenance and Material Management

APPENDIX A1

GENERAL SCENARIO - MULTIPLE PAYLOAD SYSTEMS
O&O CONCEPT - 24 HOUR PER DAY OPERATION

1. Move site once a day.

2. Section selects new site 10% of the time.

3. RPV section has responsibility for own resupply functions.

4. Average distance moved between sites is 10 miles (16KM).

5. Average highway speed 25 MPH due to weather, road conditions, and time of day/night.

6. Five AV flights per day (three are FLIR, two are daylight TV) in a 24 hour period; 365 days/year; flight time 3.0 hours.

   a. 1 MPS change per week to marry proper MPS with operational AV.

7. AV Operating Hours

1825 flights/year at 3 hours	5475.0 hr/yr
1825 flights/year at .17 hour power up on rail time	310.5 hr/yr
TOTAL	5785.5 hr/yr

8. Average on-site distance traveled between emplacements 200 meters at 5 MPH.

9. Section commanders truck used for additional tasks of:

   a. Transportation of section site selection team.

   b. On-site administrative runs of 0.8 km round-trip distance on an average of three times per day.

   c. Every other day used for resupply runs of 20 km round trip.

   d. Daily briefing runs of 20 km round trip.

10. Cargo vehicle makes one resupply run every other day of 50 km round trip.

11. Launcher and recovery systems are deployed for each launch then both return to shelter. Round trip distance is 0.4 km.

12. Recovery system redeployed for recovery for each returning flight.

13. AV handler (AVH) system operates in support of each launch, then proceeds to recovery site to support possible recovery at launch. AVH also supports each recovery and all AV handling not related to AV flights.

14. Ground Control Station operating hours/year

a. Environmental support equipment for the GCS-8522.7 hr/yr total assuming heating and cooling systems operate 4261.4 hr each (1/2 the time).

b. Off-site voice radio system (to HQ) 8522.7 hr/yr (includes maintenance time).

NOTE: a and b are based on a 8,760 hr/yr less 237.3 hours associated with site moves.

c. All other GCS equipment 8577.5 hr (365 days of operations) per year; 24 hour operating window per day less emplacement/ displacement time modified for 30 minute set up/secure time.

d. RGT operating time 8577.5 hr/yr. Same rationale as for GCS equipment noted in sub-paragraph c above.

15. Generator Operations

a. 1.5KW RGT generators operating hours same as for RGT; 8577.5 hr/yr. NOTE: Both generators are required during operating periods due to critical nature of RGT.

b. 30KW generator operating time - 8577.5 hr/yr per generator. This assumes each generator operates all the time due to 90 second power recovery time for the GCS equipment.

16. Mission planning time, exclusive of data recording and entry time, totaled 48 minutes per flight for a 30 waypoint mission. This total is based on 20 minutes analysis time plus a 70% learning curve for waypoint development with initial waypoint construction taking 3 minutes.

17. The RPV site is completely set up (100% site improvement) all of the time.

18. RPV administrative report workload consists of supervision, evaluation, and minimum reporting to satisfy necessary data inputs for higher echelons.

19. A direct support maintenance element supports four RPV sections.

APPENDIX A2

GENERAL SCENARIO - MULTIPLE PAYLOAD SYSTEMS

SUSTAINED TEMPO - 24 HOUR PER DAY OPERATION

1. Five flights per day (three are FLIR, two are daylight TV Ops). Each AV flight is scheduled for three hours in the air. Total daily operations window is 24 hours.

2. Weather/battle area conditions preclude 20% of the flights from being launched.

3. Battle AV losses are 0.83 per day. Miscellaneous AV losses are 0.33 per day. These values reflect a straight line increase from the 12 hour scenario.

4. Losses result in a 15% increase in launches.

5. The recovery system deploys for an average of 90% of the launches and 100% of the AV returns.

6. All other scenario values are the same as for the O&O operating conditions.

APPENDIX A3

GENERAL SCENARIO - MULTIPLE PAYLOAD SYSTEMS

REDUCED TEMPO - 24 HOUR PER DAY OPERATION

1. Average of 2.5 flights per day (1.5 are FLIR and 1.0 are daylight TV).

2. Daily battle loss = 0.42 AV's.

3. Daily miscellaneous loss = 0.17 AV's.

4. No increase in AV launches due to losses.

5. Recovery system deploys 70% of the time for launches.

6. AV flight hours = 912.5 hrs/yr. Total operational hours = 2892.6.

7. Site displacement occurs 5 times per week.

8. Daily operational power-up time is 23.6 hours; reduced from 24 hours due to displacement time.

9. Remaining values are the same as for sustained operations. With the exception of the number of flights, these values correspond to the 12 hour scenario factors.

APPENDIX A4

GENERAL SCENARIO - MULTIPLE PAYLOAD SYSTEMS

SURGE TEMPO - 24 HOUR PER DAY OPERATION

1. Average of 6.5 flights per day (a maximum number of flights if there are to be two displacement cycles per day). (3.9 are FLIR, and 2.6 are daylight TV).

2. Flight frequency increase due to losses will be 30%.

3. Recovery system deploys for 80% of the launches.

4. AV flight hrs = 2375.5 hrs/yr. Total op hours = 7520.8.

5. Site displacement occurs twice a day.

6. Daily battle loss = 1.67 AV's.

7. Daily miscellaneous loss = 0.67 AV's.

8. Daily operating power-up time is 22.7 hours; reduced from 24 hours due to displacement time.

9. Remaining values are the same as for sustained operations. With the exception of number of flights, these values correspond to the 12 hour scenario factors.

APPENDIX B
MANPOWER REQUIREMENTS ANALYSIS

B.1 IMAGES MODEL DATA FILE CODES

This appendix reflects the codes used in the computerized workload and manpower files. The interrelationship between fields as well as the field lengths dictated these codes.

Table B.1-1 illustrates the input records of the Interactive Manpower Aggregation Estimation System (IMAGES) workload files. One line constitutes one record. The codes used in each column of Table B.1-1, which contains a data element, are described as follows:

Description	Column
Activity	(1)
Workload Category	(2)
Task	(3)
Subtask	(4)
MOS	(5)
Grade/Skill Level	(6)
Logistic Control Number	(7)

B.2 RPV MANPOWER TASK TAXONOMY

Table B.1-1 is a listing of the baseline FLIR system manpower task taxonomy for an RPV section.

Once the RPV generic function/task networks were established, tasks were assigned to humans, machines, and software. Those tasks assigned to humans were then organized into baseline and reference system manpower task taxonomies for the RPV section. A qualitative task-by-task analysis was performed on the taxonomies to assign the lowest paygrade and skill level within an MOS capable of performing the task. AR 611-201 and Soldiers Manuals were key references in making this determination.

Table B.1-1. IMAGES Model Data File Codes and RPV Manpower Task Taxonomy

(1)	(2)	(3)	(4)	(5)	(6)	(7)
** RPV SEC	BASELINE MMH ***	FLIR *** REL SORT **	02 AUG 1983	***	MMHLD302 ***	
C MAIN 1	PM GCS	INSP	GCS DOOR	13T10	E4	XODAAR
C MAIN 1	PM GCS	SVC	AIR BAFFLE	13T10	E4	XODAA9AH
C MAIN 1	PM GCS	TEST	CHECK GCS	13T10	E4	XOD
C MAIN 1	PM GCS	TEST	GCS DOOR	13T10	E4	XODAAR
C MAIN 1	PM LS	SVC	LAUNCH SYS DY	13T10	E4	OB
C MAIN 1	PM MS	SVC	PERS CBR X20	XXXXX	E21.7.6.2	
C MAIN 1	PM RS	SVC	POST MOVE X3	13T10	E2K1.3.2.2.3.1	
C MAIN 1	PM RS	SVC	RECOV SYS DY	13T10	E4	OC
C MAIN 1	PM VH	INSP	30KW GEN	52D10	E4	GGS
C MAIN 1	PM VH	SVC	START GEN 1	52D10	E2K1.3.4.3.1.1.2	
C MAIN 1	PM VH	SVC	START GEN 2	52D10	E2D1.6.3.2.1	
C MAIN 1	PM VH	TEST	2 RGTGEN	52D10	E4K1.3.4.3.1.1.2	
C MAIN 1	PM VH	TEST	RUN GEN 1	52D10	E2D1.6.3.2.1	
C MAIN 1	PM VH	TEST	RUN GEN 2	52D10	E4D1.6.3.2.1	
C MAIN 2	CM GCS	RPR	R/R LAMP X8	13T10	E3XODAABAX	
C MAIN 2	CM VH	RPR	TRUCK, M882	13T10	E2GPVX	
C MAIN 2	CM VH	RPR	TRUCK, M927	13T10	E2GCS	
C MAIN 2	CM VH	RPR	TRUCK, M927	13T10	E2GCV	
C MAIN 2	CM VH	RPR	TRUCK, M927	13T10	E2GHV	
C MAIN 2	CM VH	RPR	TRUCK, M927	13T10	E2GMV	
C MAIN 2	CM VH	RPR	TRUCK, M942	13T10	E2GLV	
C MAIN 2	CM VH	RPR	TRUCK, M942	13T10	E2GRV	
DISP	OM	LOAD	30KW GEN 1	52D10	E2K3.2 7	
DISP	OM	LOAD	30KW GEN 2	52D10	E2D3.2.7.1	
DISP	OM	LOAD	30KW GEN 2	XXXXX	E2D3.2.7.1	
DISP	OM	LOAD	AVH TRUCK X3	13T10	E2K3.2.5	
DISP	OM	LOAD	CV TRUCK X3	XXXXX	E2D3.2.5.1	
DISP	OM	LOAD	GCS TRUCK X3	13T10	E3K3.2.1	
DISP	OM	LOAD	LS TRUCK X2	XXXXX	E2K3.2.3	
DISP	OM	LOAD	MS TRUCK	52D10	E2D3.2.2	
DISP	OM	LOAD	MS TRUCK	XXXXX	E2D3.2.2	
DISP	OM	LOAD	RGT TRLR X2	XXXXX	E2K3.2.1	
DISP	OM	LOAD	RS TRUCK X2	13T10	E3K3.2.4	
DISP	OM	LOAD	SC X2	XXXXX	E2K3.2.6	
DISP	OM	POLICE	TRASH	XXXXX	E2D3.1.2.8.1.1	
DISP	OM	RENDEZVOUS	ASSMBLE X7	XXXXX	E2K3.3.1	
DISP	OM	RENDEZVOUS	BR'EF MOVE	13T40	E7K3.3.2	
DISP	OM	RENDEZVOUS	FORM CONVOY X7	XXXXX	E2K3.3.4	
DISP	OM	RENDEZVOUS	REC BRIEF X9	XXXXX	E2K3.3.2	
DISP	OM	REPLACE	TARP BOW AVHX2	XXXXX	E2K3.2.5	
DISP	OM	REPLACE	TARP BOW CV X2	XXXXX	E2D3.2.5.1	
DISP	OM	REPLACE	TARP BOW LS X2	XXXXX	E2K3.2.3.1	
DISP	OM	REPLACE	TARP BOW RS X2	XXXXX	E2K3.2.4.1	
DISP	OM	REPLACE	TARP BOW SC X2	XXXXX	E2D3.2.6.1	
DISP	OM	REPLACE	TARP RGT X2	XXXXX	E2K3.2.1.1	
DISP	OM	SECURE	2 30KW GEN	52D10	E2D3.1.2.6.3	
DISP	OM	SECURE	AVH FOR MOV X2	13T10	E2K3.1.2.5	
DISP	OM	SECURE	CAMFLG AVH X3	XXXXX	E2D3.1.1.1	
DISP	OM	SECURE	CAMFLG CV X3	XXXXX	E2D3.1.1.1	
DISP	OM	SECURE	CAMFLG GCS X5	XXXXX	E2D3.1.1.1	
DISP	OM	SECURE	CAMFLG GEN X2	XXXXX	E2D3.1.1.1	
DISP	OM	SECURE	CAMFLG LS X3	XXXXX	E2D3.1.1.1	
DISP	OM	SECURE	CAMFLG MS X5	XXXXX	E2D3.1.1.1	
DISP	OM	SECURE	CAMFLG RGT X2	XXXXX	E2D3.1.1.1	
DISP	OM	SECURE	CAMFLG RS X3	XXXXX	E2D3.1.1.1	
DISP	OM	SECURE	COMM CABLES X2	XXXXX	E2D3.1.2.7.2	
DISP	OM	SECURE	FOC X3	13T10	E2K3.1.2.7.3	

Table B.1-1 (Continued)

DISP	OM	SECURE	GCS ANTENNA X2	13T10	E2K3.1.2.1.2
DISP	OM	SECURE	GCS EQUIP	13T10	E4K3.1.2.1.1.1
DISP	OM	SECURE	GCS FOR MOV X3	13T10	E3K3.1.2.1.2
DISP	OM	SECURE	GND SITE IMPX2	XXXXX	E2K3.1.2.6.4.1
DISP	OM	SECURE	GND SYS IMP X2	XXXXX	E2D3.1.2.6.4
DISP	OM	SECURE	LS FOR MOVE X2	13T10	E3K3.1.2.2
DISP	OM	SECURE	MCPE	XXXXX	E4D3.1.1.3
DISP	OM	SECURE	MCPE X3	XXXXX	E2D3.1.1.3
DISP	OM	SECURE	MS FOR MOVE X2	13T10P9	E4D3.1.1.2.1
DISP	OM	SECURE	PWR CABLES X2	XXXXX	E2D3.1.2.7.1.1
DISP	OM	SECURE	PWR CABLES X2	XXXXX	E2K3.1.2.7.1.1
DISP	OM	SECURE	RGT FOR MOVE	13T10	E4K3.1.2.1
DISP	OM	SECURE	RGT FOR MOVE	XXXXX	E2K3.1.2.1
DISP	OM	SECURE	RS FOR MOVE X2	13T10	E3K3.1.2.3
DISP	OM	SECURE	RS GUIDE CABLE	XXXXX	E2K3.1.2.7.3
DISP	OM	SECURE	SITE GUARD DEF	XXXXX	XXD3.1.1.5.1
DISP	OM	SECURE	SITE SENSORS	XXXXX	XXD3.1.1.4.5.2
DISP	OM	UNSET	30KW & MATE X3	XXXXX	E2K3.2.9
DISP	OM	UNSET	GCS X2	XXXXX	E2K3.2.8
DISP	OM	UNSET	MS TRUCK X2	XXXXX	E2D3.2.8.1
DISP	OM	UNSET	RGT AND MATEX3	XXXXX	E2K3.2.6
DISP	OTS	SECURE	BERTHING FACLTY	XXXXX	XXD3.1.1.4
DISP	OTS	SECURE	CBR DECOM	XXXXX	XXD3.1.1.4
DISP	OTS	SECURE	MFSS FAC	XXXXX	XXD3.1.1.4
DISP	OTS	SECURE	OFFSITE COMM WR	XXXXX	XXD3.1.1.4
DISP	OTS	SECURE	REST FAC	XXXXX	XXD3.1.1.4
DISP	OTS	SECURE	SANI FAC	XXXXX	XXD3.1.1.4
DISP	OTS	SECURE	SHOWER FAC	XXXXX	XXD3.1.1.4
EMP	INDL IMP	ADMIN	DRAFT CORRES	211B	W01.7.4.1.1
EMP	INDL IMP	ADMIN	GIVE MOS EXAMS	13T20	E51.7.3.4.4
EMP	INDL IMP	ADMIN	MAINT MAPS FILE	13T20	E51.7.4.1
EMP	INDL IMP	ADMIN	MAINT RECORDS	13T10	E41.7.4.2
EMP	INDL IMP	ADMIN	NON AV BRIEF	13T40	E71.7.4.1.1
EMP	INDL IMP	ADMIN	PERS COUNSEL	13T40	E71.7.3.2
EMP	INDL IMP	ADMIN	PERS COUNSEL	211B	W01.7.3.2
EMP	INDL IMP	ADMIN	PERS EVALS	13T40	E71.7.3.1
EMP	INDL IMP	ADMIN	PERS EVALS	211B	W01.7.3.1
EMP	INDL IMP	ADMIN	PERS SUPERVISE	13T40	E71.7.3.2
EMP	INDL IMP	ADMIN	PERS SUPERVISE	211B	W01.7.3.2
EMP	INDL IMP	MAINT SUPPLY	KEEP RECORDS	13T20P9	E51.7.2.3
EMP	INDL IMP	MAINT SUPPLY	SCDR RESUPPLY	XXXXX	E2P1.7.2.1.1
EMP	INDL IMP	MAINT SUPPLY	STOW SUPPLYS	XXXXX	E21.7.2.2
EMP	INDL IMP	MAINT SUPPLY	WORK PARTY X2	XXXXX	E2H1.6.9.4
EMP	INDL IMP	OPERATE	RESUPPLY CV	13T10	E3H1.7.2.1.2
EMP	INDL IMP	OPERATE	SC ONSITE	XXXXX	E2E1.7.2.1.2
EMP	INDL IMP	PROV SANI	DIG FILL LATRN	XXXXX	E2K1.6.9.3
EMP	INDL IMP	PROV SANI	DIG FILL TRASH	XXXXX	E2K1.6.9.2
EMP	INDL IMP	SECURITY	CONVOY GUARDX4	XXXXX	E2K1.6.9.6
EMP	INDL IMP	SECURITY	INTERNAL X2	XXXXX	E21.6.9.1
EMP	INDL IMP	SECURITY	RESUPPLY CV	XXXXX	E2H1.6.9.5
EMP	INDL IMP	SECURITY	SC RESUPPLY	XXXXX	E2P1.7.2.1.1
EMP	OM CONVOY	COMMUNICATE	OPERATE RADIO	13T10	E2K1.2.3.2.1
EMP	OM CONVOY	DETERMINE	CONVOY ROUTES	13T30	E6K1.1.4
EMP	OM CONVOY	NAVIGATE	CONVOY	13T30	E6K1.2.2
EMP	OM CONVOY	OPERATE	CONVOY TRUCKX7	XXXXX	E2K1.2.1
EMP	OM IMP	COMMUNICATE	ADDED COMM REQ	13T10	E31.6.7.4
EMP	OM IMP	COMMUNICATE	CHG CRYPTO DAY	13T10	E21.3.3.2.1.2
EMP	OM IMP	CONNECT	GEN CABLE X2	XXXXX	E2D1.6.3.2.3
EMP	OM IMP	CONNECT	MS PWR CABLESX2	XXXXX	E2D1.6.2.2
EMP	OM IMP	CONNECT	OFFSITE PWR	52D10	E41.6.9
EMP	OM IMP	CONNECT	PHONE SYST	XXXXX	E2D1.6.7.1.2.2
EMP	OM IMP	INSTALL	GND GEN 2	XXXXX	E2D1.6.3.2
EMP	OM IMP	INSTALL	GND MS X2	XXXXX	E2D1.6.2.2
EMP	OM IMP	INSTALL	MCPE	13T10	E4D1.5.6.1

Table B.1-1 (Continued)

EMP	OM IMP	INSTALL	MCPE X4	XXXXX	E2D1.6.6.1
EMP	OM IMP	LAY	GCS PWR CABLX2	XXXXX	E2D1.6.3.1
EMP	OM IMP	LAY	MS PWR CABLEX2	XXXXX	E2D1.6.2.2
EMP	OM IMP	LAY	MS PWR CABLEX2	XXXXX	E2D1.6.3.1
EMP	OM IMP	LAY	PHONE WIRE	XXXXX	E2D1.6.7.1.2.1
EMP	OM IMP	LAY	PHONE WIRE	XXXXX	E2D1.6.7.1
EMP	OM IMP	OFFLOAD	CV X2	XXXXX	E2D1.6.8.2.4
EMP	OM IMP	OFFLOAD	MS TRUCK X2	XXXXX	E2D1.6.2.1
EMP	OM IMP	OPERATE	30 KW GEN	52D10	E21.6.3.9
EMP	OM IMP	OPERATE	30 KW GEN	52D10	E41.6.3.9
EMP	OM IMP	OPERATE	REFUEL GENS	XXXXX	E21.6.8.1
EMP	OM IMP	POSITION	CV TRUCK ASST	XXXXX	E2K1.3.1.3.5.1
EMP	OM IMP	POSITION	MS TRUCK ASST	XXXXX	E2K1.3.1.3.7.1
EMP	OM IMP	REMOVE	TARP BOW CV X2	XXXXX	E2D1.6.8.2.1
EMP	OM IMP	REMOVE	TARP BOW SC X2	XXXXX	E2D1.6.8.2.2
EMP	OM IMP	SETUP	CAMFLG AVH X5	XXXXX	E2D1.6.1
EMP	OM IMP	SETUP	CAMFLG CV X5	XXXXX	E2D1.6.1
EMP	OM IMP	SETUP	CAMFLG GCS X5	XXXXX	E2D1.6.1
EMP	OM IMP	SETUP	CAMFLG GEN X5	XXXXX	E2D1.6.1
EMP	OM IMP	SETUP	CAMFLG LS X5	XXXXX	E2D1.6.1
EMP	OM IMP	SETUP	CAMFLG MS X5	XXXXX	E2D1.6.1
EMP	OM IMP	SETUP	CAMFLG RGT X7	XXXXX	E2D1.6.1
EMP	OM IMP	SETUP	CAMFLG RS X5	XXXXX	E3D1.6.1
EMP	OM IMP	SETUP	MS SHELT X2	13T10P9	E4D1.6.2.3.1
EMP	OM LAU	CONTROL	PRELAU OPS AVO	13T10	E4A1.5.4.2
EMP	OM LAU	CONTROL	PRELAU OPS MC	13T30	E6A1.5.4.2
EMP	OM LAU	CONTROL	PRELAU OPS MPO	13T10	E3A1.5.4.2
EMP	OM LAU	LAUNCH		XXXXX	XXA1.5.6
EMP	OM LAU	PREFLIGHT	ATTACH WNGS X2	13T10	E3A1.5.1.1.2.3
EMP	OM LAU	PREFLIGHT	LOAD AV ON STND	13T10	E2A1.5.1.1.2.2
EMP	OM LAU	PREFLIGHT	OPEN AV CONTAIN	13T10	E2A1.5.1.1.2.1
EMP	OM LAU	SECURE	AV TO LS	13T10	E2A1.5.1.3.3
EMP	OM LAU	SECURE	AVH FM SERVICE	13T10	E3A1.5.7.9.1
EMP	OM LAU	SECURE	LS	13T10	E3A1.5.7
EMP	OM LAU	SECURE	RS FM LAU X3	13T10	E3J1.5.7.1
EMP	OM LAU	SECURE	STOW LS AV GER	13T10	E2A1.5.1.3.3
EMP	OM LAU	SETUP	AVH FOR SERVICE	13T10	E3A1.5.7.9
EMP	OM LAU	SETUP	ENERGIZE GCS EQ	13T10	E3K1.5.4.1
EMP	OM LAU	SETUP	INST LS LADDER	XXXXX	E2A1.5.2.1.2
EMP	OM LAU	SETUP	LS IN LSS ASST	XXXXX	E2A1.5.2.1.2
EMP	OM LAU	SETUP	PREP LS FOR LAU	13T10	E3A1.5.2.2.4
EMP	OM LAU	SETUP	RIG LS DAVIT	13T10	E2A1.5.1.3
EMP	OM LAU	SETUP	RS FOR LAUNCH	13T10	E3J1.5.5.3
EMP	OM LAU	SETUP	RS IN RSS	13T10	E3J1.5.5.2
EMP	OM LAU	TRANSFER	AV TO LS X3	13T10	E3A1.5.1.3.2
EMP	OM LAU	TRANSIT	AVH TO HIDE	XXXXX	E2A1.5.7.4
EMP	OM LAU	TRANSIT	AVH TO RS	13T10	E3J1.5.5.1.1
EMP	OM LAU	TRANSIT	LS TO LSS	13T10	E3A1.5.2.1.1
EMP	OM LAU	TRANSIT	RS TO RSS	13T10	E3J1.5.5.1
EMP	OM MP	ANALYZE	MISSION PROFILE	13T30	E6A1.4.2
EMP	OM MP	BRIEF	MISSION ONSITE	13T30	E6A1.4.4
EMP	OM MP	BRIEF	OFFSITE TRAVEL	13T40	E7F1.7.7
EMP	OM MP	BRIEF	PRESENT OFSITE	13T40	E7F1.7.7
EMP	OM MP	CHECK	END DATA CK	13T10	E4A1.4.7.1.3
EMP	OM MP	CREATE	MISSION OVERLAY	13T10	E3A1.4.5
EMP	OM MP	CREATE	SIT DISP X2	13T10	E31.4.2.1
EMP	OM MP	CREATE	UPDATE INTL SIT	13T10	E3A1.4.2
EMP	OM MP	ENTER	ENTER DATA	13T10	E2A1.4.7
EMP	OM MP	ENTER	RECORD MISSION	13T10	E2A1.4.7
EMP	OM MP	OPERATE	SC TK OFSITE	XXXXX	E2F1.7.7
EMP	OM MP	SETUP	NAV DISPLAY	13T10	E2A1.4.7.2
EMP	OM SETUP	CONDUCT	VERIFY SITE SEL	13T40	E7K1.3.1.2
EMP	OM SETUP	CONDUCT	VERIFY SURVEY	13T30	E6K1.3.1.2
EMP	OM SETUP	CONNECT	FOC X2	13T10	E2K1.3.3.1.1.2

Table B.1-1 (Continued)

EMP	OM SETUP	CONNECT	GEN 1 CABLE X2	XXXXX	E2K1.3.4.1.2
EMP	OM SETUP	CONNECT	RGT GEN CABLX2	13T10	E2K1.3.4.1.2
EMP	OM SETUP	CONNECT	RS GUIDE CBLX2	13T10	E2K1.3.3.1.1.2
EMP	OM SETUP	LAY	FOC X3	13T10	E3K1.3.3.1.1.1
EMP	OM SETUP	LAY	GEN 1 CABLE X2	XXXXX	E2K1.3.4.1.1
EMP	OM SETUP	LAY	RS GUIDE CBLX2	XXXXX	E2K1.3.3.1.1.1
EMP	OM SETUP	OFFLOAD	AVH TK STUP X2	XXXXX	E2K1.3.2.2.5
EMP	OM SETUP	OFFLOAD	GCS TK X2	XXXXX	E2K1.3.2.2.2
EMP	OM SETUP	OFFLOAD	LS TK X2	XXXXX	E2K1.3.2.2.4
EMP	OM SETUP	OFFLOAD	RGT X2	XXXXX	E2K1.3.2.2.7
EMP	OM SETUP	OFFLOAD	RS TK	XXXXX	E2K1.3.2.2.3
EMP	OM SETUP	OFFLOAD	SC X2	XXXXX	E2K1.3.2.1.1
EMP	OM SETUP	POSITION	2 30KW GEN	XXXXX	E2K1.3.1.1.6
EMP	OM SETUP	POSITION	ALL TRUCKS X7	XXXXX	E2K1.3.1
EMP	OM SETUP	POSITION	GCS TRUCK ASST	XXXXX	E2K1.3.1.3.2.1
EMP	OM SETUP	POSITION	LEVEL GCS TKX2	XXXXX	E2K1.3.1.3.2.2
EMP	OM SETUP	POSITION	LEVEL LS TK X2	XXXXX	E2K1.3.1.3.3.2
EMP	OM SETUP	POSITION	LS TRUCK ASST	XXXXX	E2K1.3.1.3.3.1
EMP	OM SETUP	POSITION	RGT ASST	XXXXX	E2K1.3.1.3.6.1
EMP	OM SETUP	POSITION	RGT TRAILER	XXXXX	E2K1.3.1.1.6
EMP	OM SETUP	POSITION	RS TRUCK ASST	XXXXX	E2K1.3.1.3.4.1
EMP	OM SETUP	POSITION	SC	XXXXX	E2K1.3.1.3.1
EMP	OM SETUP	POSITION	UNHITCH RGT X2	XXXXX	E2K1.3.1.3.6.2
EMP	OM SETUP	POSITION	UNHTCH 2 30KWX2	XXXXX	E2K1.3.1.3.6.3
EMP	OM SETUP	POSITION	WALKERS 5TONX5	XXXXX	E2K1.3.1
EMP	OM SETUP	REMOVE	TARP BOW AVHX2	XXXXX	E2K1.3.2.1.5
EMP	OM SETUP	REMOVE	TARP BOW LS X2	XXXXX	E2K1.3.2.1.4
EMP	OM SETUP	REMOVE	TARP BOW RS X2	XXXXX	E2K1.3.2.1.3
EMP	OM SETUP	REMOVE	TARP RGT X2	XXXXX	E2K1.3.2.1.2
EMP	OM SETUP	SETUP	GCS ANTENNA	13T10	E2K1.3.3.4
EMP	OM SETUP	SETUP	GCS COMM	13T10	E3K1.3.3.2.1
EMP	OM SETUP	SETUP	GCS CRYPTO	13T10	E3K1.3.3.2.1.3
EMP	OM SETUP	SETUP	GCS ENVIRON	XXXXX	E2K1.3.5.4
EMP	OM SETUP	SETUP	GCS EQUIP	13T10	E3K1.3.5.4.4.1-
EMP	OM SETUP	SETUP	GCS GND X2	XXXXX	E2K1.3.4.2
EMP	OM SETUP	SETUP	GCS HARDWARE	XXXXX	E2K1.3.5.4.9.1
EMP	OM SETUP	SETUP	GCS LDR-PLAT	XXXXX	E2K1.3.5.4.4
EMP	OM SETUP	SETUP	GEN 1 GND X2	XXXXX	E2K1.3.4.2
EMP	OM SETUP	SETUP	GND RGT GEN X2	XXXXX	E2K1.3.4.2
EMP	OM SETUP	SETUP	LS FOR LAU X2	13T10	E4K1.3.2.2.4.1
EMP	OM SETUP	START	30KW GEN	52D10	E4K1.3.4.3.1.1.
EMP	OM SETUP	START	INIT DATA LOAD	13T10	E3K1.3.5.4.2.1
EMP	OM SETUP	START	RGT GEN X2	52D10	E2K1.3.4.3.1.1.
EMP	OM SS	CONDUCT	MAP RECON	13T40	E7B1.1.1
EMP	OM SS	EVALUATE	PROPOSED SITE	13T40	E7B1.1.2.3
EMP	OM SS	NAVIGATE	CROSS COUNTRY	13T20	E5B1.1.2.2
EMP	OM SS	OPERATE	RADIO	XXXXX	E2B1.1.2.4
EMP	OM SS	OPERATE	VEHICLE	XXXXX	E2B1.1.2.1
EMP	OM SS	SURVEY	ASSIST	XXXXX	E2B1.1.3
EMP	OM SS	SURVEY	PROPOSED SITE	13T40	E7B1.1.3
EMP	OTS IMP	LAY	OFFSITE WIRE	XXXXX	XXD1.6.7.1.1
EMP	OTS IMP	MAINTAIN	CBR DECON	XXXXX	XXD1.6.6.3
EMP	OTS IMP	PROVIDE	ADMIN SUPPORT	XXXXX	XX1.6.8
EMP	OTS IMP	PROVIDE	BERTHING FAC	XXXXX	XXD1.6.5.3
EMP	OTS IMP	PROVIDE	DEF POSITION	XXXXX	XXD1.6.4.2
EMP	OTS IMP	PROVIDE	DEF WIR	XXXXX	XXD1.6.4.3
EMP	OTS IMP	PROVIDE	FOXHOLES	XXXXX	XXD1.6.4.1
EMP	OTS IMP	PROVIDE	MESS FAC	XXXXX	XXD1.6.5.2
EMP	OTS IMP	PROVIDE	SANI FAC	XXXXX	XXD1.6.5.1
EMP	OTS IMP	PROVIDE	SHOWER FAC	XXXXX	XXD1.6.5.4
EMP	OTS IMP	PROVIDE	SURV SERV	XXXXX	XXD1.6.4.4
FLT OPS	OM CONTROL	CONDUCT	ARTYOBS MPC	13T10	E3A2.2.3
FLT OPS	OM CONTROL	CONTROL	AV FLIGHT AVO	13T10	E4A2.1.3
FLT OPS	OM CONTROL	CONTROL	AV MISSION MC	13T30	E6A2.2.3

Table B.1-1 (Continued)

FLT OPS	OM RECOVERY	LOAD	AV ON AVH	13T10 E4W2.3.3.4
FLT OPS	OM RECOVERY	LOAD	AV ON AVH X3	XXXXX E2W2.3.3.4
FLT OPS	OM RECOVERY	REMOVE	AV FM RS	13T10 E4W2.3.3.1
FLT OPS	OM RECOVERY	REMOVE	AV FM RS X3	XXXXX E2W2.3.3.3.1
FLT OPS	OM RECOVERY	SECURE	RS FM RECVRYX3	13T10 E3W2.3.2.1.6
FLT OPS	OM RECOVERY	SETUP	RS FOR RECVRY	13T10 E3W2.3.2.1.6
FLT OPS	OM RECOVERY	SUPERVISE	SAFETY	13T20 E5W2.2.5
FLT OPS	OM RECOVERY	TRANSIT	AV-AVH TO DEST	XXXXX E2W2.3.3
FLT OPS	OM RECOVERY	TRANSIT	AVH-RSS	XXXXX E2W2.3.3.4
ORG MAIN 1	PM AV	INSP	150 HR ENG MOD	13T10 E3150 HR PM OAA
ORG MAIN 1	PM AV	INSP	150 HR LHW	13T10P9E4150 HR PM OAD
ORG MAIN 1	PM AV	INSP	150 HR RHW	13T10P9E4150 HR PM OAE
ORG MAIN 1	PM AV	INSP	75 HR BLAD	13T10P9E475 HR PM OACB
ORG MAIN 1	PM AV	INSP	75 HR FS	13T10P9E475 HR PM OAC
ORG MAIN 1	PM AV	INSP	75 HR PROP	13T10P9E475 HR PM OAAM
ORG MAIN 1	PM AV	INSP	75 HR STRUCT	13T10P9E475 HR PM OAAA
ORG MAIN 1	PM AV	INSP	A/A SENS	13T10P9E4 OAAH
ORG MAIN 1	PM AV	INSP	ATTREF ASSY	13T10P9E4 OAAJ
ORG MAIN 1	PM AV	INSP	AV REC HORN	13T20P9E5W OAL
ORG MAIN 1	PM AV	INSP	FUEL SERV	13T10 E3 OAH
ORG MAIN 1	PM AV	INSP	PRFLT AV	13T10 E3A OA
ORG MAIN 1	PM AV	INSP	PROP AV SS	13T10P9E4W OAJ
ORG MAIN 1	PM AV	INSP	PSTFLT AV	13T10 E3W OA
ORG MAIN 1	PM AV	RPL	150 HR ALTR	13T10P9E4150 HR PM OAA
ORG MAIN 1	PM AV	RPL	150 HR ALTR	13T20P9E5150 HR PM OAA
ORG MAIN 1	PM AV	RPL	150 HR ALTR	13T10P9E4150 HR PM OAA
ORG MAIN 1	PM AV	RPL	150 HR PROP	13T10P9E4150 HR PM OAA
ORG MAIN 1	PM AV	RPL	300 HR FPUMP	13T10P9E4300 HR PM OAC
ORG MAIN 1	PM AV	RPL	75 HR SPK PLG	13T10 E375 HR PM OAAM
ORG MAIN 1	PM AV	RPL	75 HR SPK PLG	13T10P9E475 HR PM OAAM
ORG MAIN 1	PM AV	RPL	MPS DAY/FLIR	13T10P9E4 OE
ORG MAIN 1	PM AV	RPL	MPS DAY/FLIR	13T10P9E4 OE
ORG MAIN 1	PM AV	SVC	150 HR ENG MAIN	13T10 E4150 HR PM OAA
ORG MAIN 1	PM AV	SVC	150 HR ENG MAIN	13T10P9E4150 HR PM OAA
ORG MAIN 1	PM AV	SVC	AV 75 HR	13T10 E375 HR PM OA
ORG MAIN 1	PM AV	SVC	AV 75 HR	13T10P9E475 HR PM OA
ORG MAIN 1	PM AV	SVC	CLN SHRD WNDWS	13T10 E2A OEBAB
ORG MAIN 1	PM AV	SVC	DMPS (3XWK)	13T10 E4 OE
ORG MAIN 1	PM AV	SVC	FMPS (3XWK)	13T10 E4FOE
ORG MAIN 1	PM AV	SVC	PRFLT AV	13T10 E3A OA
ORG MAIN 1	PM AVH	INSP	AV CONTAINER	13T10 E2 OAT
ORG MAIN 1	PM AVH	INSP	AV HOIST FX	13T20 E5 OAN
ORG MAIN 1	PM AVH	INSP	CRANE	13T10P9E4 OASA
ORG MAIN 1	PM AVH	INSP	CRANE KIT	13T10P9E4 OAS
ORG MAIN 1	PM GCS	INSP	AIR FILTER	13T10P9E4 XODAAK
ORG MAIN 1	PM GCS	INSP	AUX SYS PWR	13T10P9E4 XODAAXX
ORG MAIN 1	PM GCS	INSP	BLWR CENTR	13T10P9E4 XODAAJCE
ORG MAIN 1	PM GCS	INSP	DATA LINK	13T10 E4 ODAC
ORG MAIN 1	PM GCS	INSP	ELECT INSTL	13T10P9E4 XODAA3
ORG MAIN 1	PM GCS	INSP	NAV DISP SYS DA	13T10P9E4 ODAJ
ORG MAIN 1	PM GCS	INSP	PSG-2A	13T10 E4 XODAB3
ORG MAIN 1	PM GCS	INSP	PWR CABLE	52D10 E4 OD9
ORG MAIN 1	PM GCS	INSP	PWR MONITOR	13T10P9E4 XODAA3AE
ORG MAIN 1	PM GCS	INSP	PWR REEL	XXXXX E2 OD9
ORG MAIN 1	PM GCS	INSP	SHELTER ASSY	13T10P9E4 XODA
ORG MAIN 1	PM GCS	INSP	T/C TERM	13T20P9E5 OD4
ORG MAIN 1	PM GCS	INSP	TA-312 BAT 7XH	13T10 E3 XODBA5
ORG MAIN 1	PM GCS	INSP	VRC-46 (4XHR)	13T10 E4 XODAB4
ORG MAIN 1	PM GCS	SVC	AIR FILTER	13T20P9E5 XODAAK
ORG MAIN 1	PM GCS	SVC	BA ASSY	13T20P9E5 XODADF
ORG MAIN 1	PM GCS	SVC	BA FILT	13T20P9E5 ODAEF
ORG MAIN 1	PM GCS	SVC	BA FILT	13T20P9E5 ODAFF
ORG MAIN 1	PM GCS	SVC	BA FILT	13T20P9E5 ODAFH
ORG MAIN 1	PM GCS	SVC	BA FILT/DLA	13T20P9E5 ODALC

Table B.1-1 (Continued)

ORG MAIN 1	PM GCS	SVC	COM/SIG RK	13T20P9E5	XODAL
ORG MAIN 1	PM GCS	SVC	GCS DOOR	13T20P9E5	XODAAR
ORG MAIN 1	PM GCS	SVC	GCSIU F SCN	13T20P9E5	ODA[illegible]
ORG MAIN 1	PM GCS	SVC	GCSIU S SCN	13T20P9E5	ODALU
ORG MAIN 1	PM GCS	SVC	MCPE	13T10P9E4	XODAAX
ORG MAIN 1	PM GCS	SVC	PRC 68 BAT 5XH	XXXXX E2	ODAB1
ORG MAIN 1	PM GCS	SVC	T/C TERM	13T20P9E5	OD4
ORG MAIN 1	PM GCS	SVC	VRA	13T10 E4	ODAFK
ORG MAIN 1	PM GCS	SVC	VRA	13T20P9E5	ODAFK
ORG MAIN 1	PM GCS	TEST	AUX SYS PWR	13T10P9E4	XODAAXX
ORG MAIN 1	PM GCS	TEST	AV C+D	13T20P9E5	ODADH
ORG MAIN 1	PM GCS	TEST	BLWR CENTR	13T10P9E4	XODAAJCE
ORG MAIN 1	PM GCS	TEST	MC C+D	13T20P9E5	ODAFH
ORG MAIN 1	PM GCS	TEST	MP C+D	13T20P9E5	ODAEH
ORG MAIN 1	PM GCS	TEST	POWER CABLE	13T10 E4	XODALQ
ORG MAIN 1	PM GCS	TEST	PRC-66 (5XHR)	XXXXX E2	XODAB1
ORG MAIN 1	PM GCS	TEST	PWR MONITOR	13T10P9E4	XODAA3AE
ORG MAIN 1	PM GCS	TEST	SHELTER ASSY	13T10P9E4	XODA
ORG MAIN 1	PM GCS	TEST	T/C TERM	13T20P9E5	OD4
ORG MAIN 1	PM LS	SVC	LAUNCH SYS MO	13T10P9E4	OB
ORG MAIN 1	PM LS	TEST	SHUTTLE	13T10P9E4A	OB
ORG MAIN 1	PM MS	INSP	AC PWR PNL	13T10P9E4	OGQC
ORG MAIN 1	PM MS	INSP	ADT TESTSET	13T10P9E4	OGQH
ORG MAIN 1	PM MS	INSP	AIR COND	13T10P9E4	OGAAN
ORG MAIN 1	PM MS	INSP	AIR FILTER	XXXXX E2	OGAAP
ORG MAIN 1	PM MS	INSP	AV FAULT CK	13T10P9E4	OGQ
ORG MAIN 1	PM MS	INSP	AV WING STE	13T10 E2	OGX
ORG MAIN 1	PM MS	INSP	AV WING STE WK	13T10 E2	OGX
ORG MAIN 1	PM MS	INSP	AV WING STE WK	13T10 E4	OGR
ORG MAIN 1	PM MS	INSP	AV WORKSTAND	13T10 E2	OGZ
ORG MAIN 1	PM MS	INSP	AVFI TRG IF	13T10P9E4	OGQJ
ORG MAIN 1	PM MS	INSP	BLOWER INST	13T10P9E4	OGAAK
ORG MAIN 1	PM MS	INSP	CLN BLOWER	XXXXX E2	OGAAK
ORG MAIN 1	PM MS	INSP	DC PWR ASSY	13T10P9E4	OGQKBX
ORG MAIN 1	PM MS	INSP	DOOR INST	XXXXX E2	OGAAM
ORG MAIN 1	PM MS	INSP	ELECTRIC INST	13T10P9E4	OGAAL
ORG MAIN 1	PM MS	INSP	ELEVON TCAB	13T10P9E4	OGQKA
ORG MAIN 1	PM MS	INSP	HOIST	13T10 E2	OGY
ORG MAIN 1	PM MS	INSP	INSP NPS	13T10P9E4	OGR
ORG MAIN 1	PM MS	INSP	LOGIC DRAWR	13T10P9E4	OGQB
ORG MAIN 1	PM MS	INSP	MPS LIFT FX	XXXXX E2	OEV
ORG MAIN 1	PM MS	INSP	OPER ASSY	13T10P9E4	OGQD
ORG MAIN 1	PM MS	INSP	POWER MONT	13T10P9E4	OGAALAE
ORG MAIN 1	PM MS	INSP	PWR SUPLY A	13T10P9E4	OGQF
ORG MAIN 1	PM MS	INSP	PWR SUPLY B	13T10P9E4	OGQG
ORG MAIN 1	PM MS	INSP	RACK ASSY	13T10P9E4	OGQEX
ORG MAIN 1	PM MS	INSP	RELAY ASSY	13T10P9E4	OGQBJX
ORG MAIN 1	PM MS	INSP	SELF TEST FX	13T10P9E4	OGQCX
ORG MAIN 1	PM MS	INSP	SHELT	XXXXX E2	OGAA
ORG MAIN 1	PM MS	INSP	TEST CABLE	13T10P9E4	OGQK
ORG MAIN 1	PM MS	INSP	UMB INTC AY	13T10P9E4	OGQL
ORG MAIN 1	PM MS	INSP	UMB TES CAB	13T10P9E4	OGQKB
ORG MAIN 1	PM MS	INSP	VIDEO MONTR	13T10P9E4	O[illegible]
ORG MAIN 1	PM MS	SVC	F/B ASSY	13T20P9E5	[illegible]
ORG MAIN 1	PM MS	SVC	M-13 DECON	XXXXX E2	[illegible]
ORG MAIN 1	PM MS	SVC	TEST EQ CAL PM	13T20P9E5	OG
ORG MAIN 1	PM MS	SVC	TEST EQ CAL PM	13T20P9E5	OG
ORG MAIN 1	PM MS	TEST	AC PWR PNL	13T10P9E4	OGQC
ORG MAIN 1	PM MS	TEST	AV FAULT	13T10P9E4	OGQ
ORG MAIN 1	PM MS	TEST	DC PWR ASSY	13T10P9E4	OGQKBX
ORG MAIN 1	PM MS	TEST	LOGIC DRAWR	13T10P9E4	OGQB
ORG MAIN 1	PM MS	TEST	OPER ASSY	13T10P9E4	OGQD
ORG MAIN 1	PM MS	TEST	RELAY ASSY	[illegible]	OGQBJX
ORG MAIN 1	PM RS	SVC	RECOV SYS MO	[illegible]	OC

Table B.1-1 (Continued)

ORG MAIN 1	PM VH	INSP	1.5KW GEN X2	52D10	E4	MGRGT
ORG MAIN 1	PM VH	INSP	30KW GEN 1	52D10	E2	GGS
ORG MAIN 1	PM VH	INSP	30KW GEN 2	52D10	E2	GGS
ORG MAIN 1	PM VH	INSP	TRLR, M116 DY	XXXXX	E2	GRG
ORG MAIN 1	PM VH	INSP	TRLR, M116 MO	XXXXX	E2	GRG
ORG MAIN 1	PM VH	INSP	TRLR, M116 SA	52D10	E2	GRG
ORG MAIN 1	PM VH	INSP	TRLR, M116 WK	XXXXX	E2	GRG
ORG MAIN 1	PM VH	INSP	TRLR, M200 DY2	XXXXX	E2	GGT
ORG MAIN 1	PM VH	INSP	TRLR, M200 MO2	XXXXX	E2	GGT
ORG MAIN 1	PM VH	INSP	TRLR, M200 WK2	XXXXX	E2	GGT
ORG MAIN 1	PM VH	INSP	TRUCK, M882 DY	XXXXX	E2	GPV
ORG MAIN 1	PM VH	INSP	TRUCK, M882 MO	XXXXX	E2	GPV
ORG MAIN 1	PM VH	INSP	TRUCK, M882 WK	XXXXX	E2	GPV
ORG MAIN 1	PM VH	INSP	TRUCK, M927 DY	XXXXX	E2	GCS
ORG MAIN 1	PM VH	INSP	TRUCK, M927 DY	XXXXX	E2	GCV
ORG MAIN 1	PM VH	INSP	TRUCK, M927 DY	XXXXX	E2	GHV
ORG MAIN 1	PM VH	INSP	TRUCK, M927 DY	XXXXX	E2	GMV
ORG MAIN 1	PM VH	INSP	TRUCK, M927 MO	XXXXX	E2	GCS
ORG MAIN 1	PM VH	INSP	TRUCK, M927 MO	XXXXX	E2	GCV
ORG MAIN 1	PM VH	INSP	TRUCK, M927 MO	XXXXX	E2	GHV
ORG MAIN 1	PM VH	INSP	TRUCK, M927 MO	XXXXX	E2	GMV
ORG MAIN 1	PM VH	INSP	TRUCK, M927 WK	XXXXX	E2	GCS
ORG MAIN 1	PM VH	INSP	TRUCK, M927 WK	XXXXX	E2	GCV
ORG MAIN 1	PM VH	INSP	TRUCK, M927 WK	XXXXX	E2	GHV
ORG MAIN 1	PM VH	INSP	TRUCK, M927 WK	XXXXX	E2	GMV
ORG MAIN 1	PM VH	INSP	TRUCK, M942 DY	XXXXX	E2	GLV
ORG MAIN 1	PM VH	INSP	TRUCK, M942 DY	XXXXX	E2	GRV
ORG MAIN 1	PM VH	INSP	TRUCK, M942 MO	XXXXX	E2	GLV
ORG MAIN 1	PM [illegible]	INSP	TRUCK, M942 MO	XXXXX	E2	GRV
ORG MAIN 1	P[illegible]	INSP	TRUCK, M942 WK	XXXXX	E2	GLV
ORG MAIN 1	P[illegible]	INSP	TRUCK, M942 WK	XXXXX	E2	GRV
ORG MAIN 1	PM [illegible]	LUBE	TRUCK, M882 DY	XXXXX	E2	GPV
ORG MAIN 1	PM VH	LUBE	TRUCK, M927 DY	XXXXX	E2	GCS
ORG MAIN 1	PM VH	LUBE	TRUCK, M927 DY	XXXXX	E2	GCV
ORG MAIN 1	PM VH	LUBE	TRUCK, M927 DY	XXXXX	E2	GHV
ORG MAIN 1	PM VH	LUBE	TRUCK, M927 DY	XXXXX	E2	GMV
ORG MAIN 1	PM VH	LUBE	TRUCK, M927 MO	XXXXX	E2	GCS
ORG MAIN 1	PM VH	LUBE	TRUCK, M927 MO	XXXXX	E2	GCV
ORG MAIN 1	PM VH	LUBE	TRUCK, M927 MO	XXXXX	E2	GHV
ORG MAIN 1	PM VH	LUBE	TRUCK, M927 MO	XXXXX	E2	[illegible]
ORG MAIN 1	PM VH	LUBE	TRUCK, M942 DY	XXXXX	E2	[illegible]
ORG MAIN 1	PM VH	LUBE	TRUCK, M942 DY	XXXXX	E2	G[illegible]
ORG MAIN 1	PM VH	LUBE	TRUCK, M942 MO	XXXXX	E2	GLV
ORG MAIN 1	PM VH	LUBE	TRUCK, M942 MO	XXXXX	E2	GRV
ORG MAIN 2	CM AV	ADJ	PROPUL SYS	13T10P9E4OAAM		
ORG MAIN 2	CM AV	INSP	AF AV RPR	13T10P9E4OA		
ORG MAIN 2	CM AV	INSP	AV PWR CAB	13T20 E5OAAE		
ORG MAIN 2	CM AV	INSP	DMPS	13T10P9E4OE		
ORG MAIN 2	CM AV	INSP	FMPS	13T10P9E4FOE		
ORG MAIN 2	CM AV	INSP	FUEL SYS	13T10 E3OAC		
ORG MAIN 2	CM AV	INSP	FUEL SYS	13T10P9E4OAC		
ORG MAIN 2	CM AV	INSP	PROPUL SYS	13T10P9E4OAAM		
ORG MAIN 2	CM AV	R/R	A/A SENS	13T10P9E4OAAHX		
ORG MAIN 2	CM AV	R/R	ADT ELECTRON	13T10 E3OAAWAF		
ORG MAIN 2	CM AV	R/R	ADT ELECTRON	13T10P9E4OAAWAF		
ORG MAIN 2	CM AV	R/R	ATTREF ASSY	13T10P9E4OAAJ		
ORG MAIN 2	CM AV	R/R	AV PWR CAB	13T20 E5OAAE		
ORG MAIN 2	CM AV	R/R	DMPS	13T10 E4OE		
ORG MAIN 2	CM AV	R/R	DMPS	13T10P9E4OE		
ORG MAIN 2	CM AV	R/R	ENGINE ASSY	13T10 E3OAAMABAH		
ORG MAIN 2	CM AV	R/R	ENGINE ASSY	13T10P9E4OAAMABAH		
ORG MAIN 2	CM AV	R/R	ENGINE MODULE	13T10P9E4OAAMAB		
ORG MAIN 2	CM AV	R/R	FCEP	13T10P9E4OAAL		
ORG MAIN 2	CM AV	R/R	FMPS	13T10 E4FOE		

Table B.1-1 (Continued)

ORG MAIN 2	CM AV	R/R	FMPS	13T10P9E4F0E	
ORG MAIN 2	CM AV	R/R	FUEL SYS COMP	13T10 E40ACX	
ORG MAIN 2	CM AV	R/R	FUEL SYS COMP	13T10P9E40ACX	
ORG MAIN 2	CM AV	R/R	LH WING	13T10 E30ADX	
ORG MAIN 2	CM AV	R/R	LH WING	13T10P9E40ADX	
ORG MAIN 2	CM AV	R/R	NIR	13T10P9E40AAK	
ORG MAIN 2	CM AV	R/R	PWR ASSY	13T10P9E40AABX	
ORG MAIN 2	CM AV	R/R	RH WING	13T10 E30AEX	
ORG MAIN 2	CM AV	R/R	RH WING	13T10P9E40AEX	
ORG MAIN 2	CM AV	RPR	A/A SENS	13T10P9E40AAHX	
ORG MAIN 2	CM AV	RPR	FUEL BLADDER	13T10P9E40ACB	
ORG MAIN 2	CM AV	RPR	FUSELAGE	13T10P9E40AAAX	
ORG MAIN 2	CM AV	RPR	LH WING	13T10 E30ADX	
ORG MAIN 2	CM AV	RPR	LH WING	13T10P9E40ADX	
ORG MAIN 2	CM AV	RPR	NIR	13T10P9E40AAK	
ORG MAIN 2	CM AV	RPR	RH WING	13T10 E30AEX	
ORG MAIN 2	CM AV	RPR	RH WING	13T10P9E40AEX	
ORG MAIN 2	CM AV	RPR	SURFACES	13T10P9E40ADX	
ORG MAIN 2	CM AV	RPR	SURFACES	13T10P9E40AEX	
ORG MAIN 2	CM AV	TEST	AV PWR CAB	13T20 E50AAE	
ORG MAIN 2	CM AVH	INSP	SUPP STAND	13T10 E40AJ	X
ORG MAIN 2	CM AVH	R/R	AV HOIST FX	13T20P9E50AN	X
ORG MAIN 2	CM AVH	R/R	CRANE KIT	13T10P9E40AS	
ORG MAIN 2	CM AVH	R/R	FUEL SERV	13T10 E40AH	
ORG MAIN 2	CM AVH	R/R	REC SYS COMP	13T20P9E50AL	X
ORG MAIN 2	CM AVH	RPR	AV HOIST FX	13T20P9E50AN	X
ORG MAIN 2	CM AVH	RPR	AV SUPP STD	13T20P9E50AJ	X
ORG MAIN 2	CM AVH	RPR	FUEL SERV	13T10P9E40AH	
ORG MAIN 2	CM AVH	TEST	AV HOIST FX	13T10 E40AN	X
ORG MAIN 2	CM AVH	TEST	FUEL SERV	13T10P9E40AH	
ORG MAIN 2	CM GCS	INSP	IMAGE SIMU	13T20 E50D6X	
ORG MAIN 2	CM GCS	INSP	MAIN COMPUTER	13T20P9E50DALBAA	
ORG MAIN 2	CM GCS	INSP	MC C+D ASSY	13T20P9E50DAFA	
ORG MAIN 2	CM GCS	INSP	MCPE	13T10P9E4X0DAAX	
ORG MAIN 2	CM GCS	R/R	AV C+D COMP	13T20P9E50DADH	
ORG MAIN 2	CM GCS	R/R	DATA LOADER	13T10 E40DALC	
ORG MAIN 2	CM GCS	R/R	AV C+D ASSY	13T10 E40DADX	
ORG MAIN 2	CM GCS	R/R	AV C+D ASSY	13T20P9E50DADX	
ORG MAIN 2	CM GCS	R/R	DATA LOADER	13T20P9E50DALC	
ORG MAIN 2	CM GCS	R/R	GCS CPU	13T10 E40DALB	X
ORG MAIN 2	CM GCS	R/R	GCS CPU	13T20P9E50DALB	X
ORG MAIN 2	CM GCS	R/R	GCS IU	13T10 E40DALD	
ORG MAIN 2	CM GCS	R/R	MAIN COMP PCB	13T20P9E50DALBAA	
ORG MAIN 2	CM GCS	R/R	MC C+D ASSY	13T10 E40DAFA	
ORG MAIN 2	CM GCS	R/R	MC C+D ASSY	13T20P9E50DAFA	
ORG MAIN 2	CM GCS	R/R	MC C+D COMP	13T20P9E50DAFH	
ORG MAIN 2	CM GCS	R/R	MCPE	13T10P9E4X0DAAX	
ORG MAIN 2	CM GCS	R/R	MP C+D COMP	13T20P9E50DAEH	
ORG MAIN 2	CM GCS	R/R	MP R/R ASSY	13T10 E40DAEX	
ORG MAIN 2	CM GCS	R/R	MP R/R ASSY	13T20P9E50DAEX	
ORG MAIN 2	CM GCS	R/R	NAV DISP UNIT	13T10P9E40DAJ	X
ORG MAIN 2	CM GCS	R/R	NAV DISP UNIT	13T10P9E40DAJ	X
ORG MAIN 2	CM GCS	R/R	PORT DATA DEV	13T10P9E40D7	
ORG MAIN 2	CM GCS	R/R	PWR CABLE/MISC	13T20 E5X0DALPX	
ORG MAIN 2	CM GCS	R/R	SHELT ASSY	13T10P9E4X0DAA	
ORG MAIN 2	CM GCS	R/R	SHELT MISC	13T10P9E4X0DA	X
ORG MAIN 2	CM GCS	R/R	T/C TERM	13T20P9E5X0D4	
ORG MAIN 2	CM GCS	R/R	TRNG IU	13T10P9E40D6A	
ORG MAIN 2	CM GCS	R/R	VRA COMP	13T10 E40DAFK	
ORG MAIN 2	CM GCS	R/R	VRA COMP	13T20P9E50DAFK	
ORG MAIN 2	CM GCS	RPR	AV C+D CNSOLE	13T10 E40DAD	
ORG MAIN 2	CM GCS	RPR	AV C+D CNSOLE	13T20P9E50DAD	
ORG MAIN 2	CM GCS	RPR	AV C+D COMP	13T20P9E50DADH	
ORG MAIN 2	CM GCS	RPR	COM/SIG RK	13T10 E4X0DAL	

Table B.1-1 (Continued)

ORG MAIN 2	CM GCS	RPR	COM/SIG RK	13T20P9E5X0DAL	
ORG MAIN 2	CM GCS	RPR	DATA LOADER	13T20P9E50DALC	
ORG MAIN 2	CM GCS	RPR	DC PWR COMM	13T10P9E4X0DAB6	
ORG MAIN 2	CM GCS	RPR	GCS IU	13T20P9E50DALD	
ORG MAIN 2	CM GCS	RPR	GDT R/R COMP	13T20P9E50DADG	
ORG MAIN 2	CM GCS	RPR	MAIN COMP ASSY	13T20P9E50DALBAA	
ORG MAIN 2	CM GCS	RPR	MC C+D CN	13T20P9E50DAF	
ORG MAIN 2	CM GCS	RPR	MC C+D COMP	13T20P9E50DAFH	
ORG MAIN 2	CM GCS	RPR	MCPE	13T10P9E4X0DAAX	
ORG MAIN 2	CM GCS	RPR	MP C+D CNSOLE	13T10 E40DAE	
ORG MAIN 2	CM GCS	RPR	MP C+D CNSOLE	13T20P9E50DAE	
ORG MAIN 2	CM GCS	RPR	MP C+D COMP	13T20P9E50DAEH	
ORG MAIN 2	CM GCS	RPR	NAV DISP UNIT	13T10P9E40DAJ	X
ORG MAIN 2	CM GCS	RPR	SHELT ASSY	13T10P9E4X0DA	X
ORG MAIN 2	CM GCS	RPR	VRC-46 (X4)	13T10P9E4X0DAB4	
ORG MAIN 2	CM GCS	TEST	AV C+D CNSOLE	13T10 E40DAD	
ORG MAIN 2	CM GCS	TEST	AV C+D CNSOLE	13T20P9E50DAD	
ORG MAIN 2	CM GCS	TEST	C+D ASSY	13T20P9E50DADX	
ORG MAIN 2	CM GCS	TEST	C+D ASSY	13T20P9E50DADX	
ORG MAIN 2	CM GCS	TEST	DATA LOADER	13T20P9E50DALC	
ORG MAIN 2	CM GCS	TEST	IMAGE SIMU	13T20 E50D6X	
ORG MAIN 2	CM GCS	TEST	MC C+D ASSY	13T20P9E50DAFA	
ORG MAIN 2	CM GCS	TEST	MC C+D CN	13T10 E40DAF	
ORG MAIN 2	CM GCS	TEST	MC C+D CN	13T20P9E50DAF	
ORG MAIN 2	CM GCS	TEST	MP ASSY	13T20P9E50DAEX	
ORG MAIN 2	CM GCS	TEST	MP C+D CNSOLE	13T10 E40DAE	
ORG MAIN 2	CM GCS	TEST	MP C+D CNSOLE	13T20P9E50DAE	
ORG MAIN 2	CM GCS	TEST	NAV DISP UNIT	13T10P9E40DAJ	X
ORG MAIN 2	CM GCS	TEST	VRA COMP	13T20P9E50DAFK	
ORG MAIN 2	CM LS	INSP	AV LOADER	13T10 E40BAX	
ORG MAIN 2	CM LS	INSP	LAUNCH SYS	13T10P9E40BAX	
ORG MAIN 2	CM LS	R/R	AV LOAD ASSY	13T10P9E40BAX1	
ORG MAIN 2	CM LS	R/R	HYD PUMP	13T20P9E50BMA	
ORG MAIN 2	CM LS	R/R	LAUNCH ASSY	13T20P9E5C[illegible]C	X
ORG MAIN 2	CM LS	R/R	LAUNCH SYS COMP	13T10P9E40BAX	
ORG MAIN 2	CM LS	RPR	AV LOADER	13T10 E40BAX	
ORG MAIN 2	CM LS	RPR	R/R ASSY COMP	13T20P9E50BC	X
ORG MAIN 2	CM LS	TEST	AV LOADER	13T10 E40BAX	
ORG MAIN 2	CM MIC	R/R	DATA LINK RACK	13T10P9E40DAC	
ORG MAIN 2	CM MIC	R/R	INIT ASSY	13T10P9E4MBB1	
ORG MAIN 2	CM MIC	R/R	RGT	13T10P9E4MRGT	
ORG MAIN 2	CM MIC	RPR	DATA LINK R/R	13T10P9E40DAC	
ORG MAIN 2	CM MS	R/R	AIR CONDITN	13T10P9E40GAAN	
ORG MAIN 2	CM MS	R/R	AV FAULT ISOL	13T10P9E40GQ	X
ORG MAIN 2	CM MS	R/R	AV WING STE	13T10P9E40GX	
ORG MAIN 2	CM MS	R/R	SHELT MISC	13T10P9E40GAA	1
ORG MAIN 2	CM MS	RPR	AV COOL ASSY	13T10 E40GP	
ORG MAIN 2	CM MS	RPR	AV FAULT ISOL	13T10P9E40GQ	1
ORG MAIN 2	CM MS	RPR	AV WORKSTAND	13T10P9E40GZ	
ORG MAIN 2	CM MS	RPR	ELECTRIC SYS	13T10P9E40GAAL	X
ORG MAIN 2	CM MS	RPR	MPS LIFT FX	13T10P9E40EV	
ORG MAIN 2	CM MS	RPR	MS HOIST	13T10P9E40GY	
ORG MAIN 2	CM MS	RPR	SHELT	13T10P9E40GAA	
ORG MAIN 2	CM RS	INSP	INTERFACE	13T10P9E40CB	
ORG MAIN 2	CM RS	INSP	RECOVR ASSY	13T10P9E40CA	
ORG MAIN 2	CM RS	R/R	RECOVR ASSY	13T10P9E40CA	
ORG MAIN 2	CM RS	R/R	RECOVR INTFCE	13T10P9E40CB	
ORG MAIN 2	CM RS	RPR	R/R RECOVR ASSY	13T10P9E40CA	
ORG MAIN 2	CM VH	R/R	PWR REEL/CBL	52D10 E40D9	
ORG MAIN 2	CM VH	RPR	1.5KW GEN X2	52D10 E4MGRGT	
ORG MAIN 2	CM VH	RPR	30KW GEN 1	52D10 E40GS	
ORG MAIN 2	CM VH	RPR	30KW GEN 2	52D10 E40GS	
ORG MAIN 2	CM VH	RPR	PWR REEL/CBL	52D10 E40D9	

APPENDIX C

SUMMARY OF MOS ASSIGNMENTS BY EQUIPMENT

Table C-1 contains all of the MOSs required for the RPV equipment configurations. Changes from the previous study are identified by the delta symbol (Δ). The FLIR mission payload assembly was the only new equipment added.

Table C-1

Summary of MOS Assignments by Equipment

LOGISTICS CONTROL NUMBER	EQUIPMENT NAME	REFERENCE C	REFERENCE O	REFERENCE DS	BASELINE C	BASELINE O	BASELINE DS
	END ITEM: AIR VEHICLE						
FOE	FLIR Mission Payload Assembly	Δ13T	Δ13TP9	--	Δ13T	Δ13TP9	--
OAAA,OAD,OAE	Fuselage Structure, Exterior Surfaces	13T	13TP9	44B	13T	13TP9	44B
OAAB,OAAE,OAAMABAF, OAAMABAH,OAC	Engine Fuel and Electrical Systems	13T	13TP9 63B	63G	13T	13TP9	63G
OAAG	Regulated Power Supply	13T	13TP9	35E	13T	13TP9	--
OAAH,OAAX	Airspeed and Altitude Sensors	13T	13TP9	35E	13T	13TP9	--
OAAJ	Attitude Reference Assembly	13T	13TP9	35E	13T	13TP9	--
OAAL,OADA,OAEA	Flight Control Electronic Package, Control Actuators	13T	13TP9	34Y	13T	13TP9	--
OAALAB	Central Processing Unit Module Assembl	13T	13TP9	34Y	13T	13TP9	--
OAAM,OAAMAB	Propulsion System, Engine Module	13T	13TP9	52D	13T	13TP9	--
OAAWAF	Airborne Data Terminal	13T	13TP9	--	13T	13TP9	--
OEAAB,OEAAD	Television Camera	13T	13TP9	26T	13T	13TP9	--
OEAAC,OEAAE	Laser System	13T	13TP9	45G	13T	13TP9	--
OEAAF-OEBAA	Mission Payload System Assemblies	13T	13TP9	35E	13T	13TP9	--
	END ITEM: AIR VEHICLE HANDLER						
GHV	Truck	13T	63B	63W 63G	13T	63B	63W 63G
OAH	Fuel Service Assembly	13T	13TP9	63J	13T	13TP9	63J
OAS	Handling Crane	13T	13TP9	63W	13T	13TP9	63W
OAL,OAT	AV Recovery Harness, AV Container	13T	13TP9	44B	13T	13TP9	44B
	END ITEM: CARGO VEHICLE						
GCV	Truck	13T	63B	63W 63G	13T	63B	63W 63G
	END ITEM: GENERATORS						
GGT	Trailer	Δ52D	Δ52D	63W	Δ52D	Δ52D	63W
GGS	Generator Set 30 KW	Δ52D	Δ52D	52D	Δ52D	Δ52D	52D
	END ITEM: GROUND CONTROL STATION						
GCS	Truck	13T	63B	63W 63G	13T	63B	63W 63G

Δ Change from previous study.

Table C-1 (Continued)

LOGISTICS CONTROL NUMBER	EQUIPMENT NAME	REFERENCE			BASELINE		
		C	O	DS	C	O	DS
ODA	Shelter	13T	13TP9	44B	13T	13TP9	44B
ODAA,ODAAX	Shelter Assembly, MCI 3, Air Conditioning	13T	13TP9	52C	13T	13TP9	52C
ODAA4	Protective Entrance	13T	13TP9	52C 43M	13T	13TP9	52C 43M
ODAA2	Chemical Agent Detector M13	13T	31V	31E	13T	Δ31V	31E
ODAA3	Radiac Meters	13T	13TP9	35H	13T	13TP9	35H
ODAA3AE	Power Monitor	13T	13TP9	34Y	13T	13TP9	Δ31E
ODAB1	Radio Set AN/PRC-68	13T	31V	31E	13T	Δ31V	31E
ODAB2	Antenna OE-254	13T	31V	31E	13T	Δ31V	31E
ODAB3	Digital Message Device AN/PSG-2A	13T	31V	34Y	13T	Δ31V	34Y
ODAB4	Radio Set AN/VRC-46	13T	31V	31E	13T	Δ31V	31E
ODAB5,ODAB7	Secure Equipment TSEC/KY-57 & HYX-57/TSEC	13T	31V	31S	13T	Δ31V	31S
ODAB6	Direct Current Communications Power	13T	31V	31E	13T	Δ31V	31E
ODAB8,ODAB9	Communications Mode Selector Control, Misc. Comm.	13T	31V	31E	13T	Δ31V	31E
ODABX	Telephone Set TA-312/PT	13T	31V	36H	13T	Δ31V	36H
ODAC1	Data Link Power Supply	13T	13TP9	31E	13T	13TP9	--
ODAC2	Video Reconstruction Unit	13T	13TP9	26T	13T	13TP9	--
ODAC3	Master Interface Unit	13T	13TP9	26L	13T	13TP9	--
ODADA,ODAEA,ODAFA	Video Monitor Assembly	13T	13TP9	26T	13T	13TP9	--
ODADE,ODAEE,ODAFE	Communications Panel Assembly	13T	31V	31E	13T	Δ31V	--
ODADG	Ground Data Terminal Ground Display	13T	13TP9	34Y	13T	13TP9	--
ODADH	AV Control & Display Assembly	13T	13TP9	34Y	13T	13TP9	--
ODAEH	Mission Payload Control & Display Assembly	13T	13TP9	34Y	13T	13TP9	--
ODAFH	Mission Commander's Control & Display Assembly	13T	13TP9	34Y	13T	13TP9	--
ODAFK	Video Recorder Assembly	13T	13TP9	26T	13T	13TP9	--
ODAGB	Teleprinter Assembly AN/UGC-74A	13T	13TP9	31J	13T	13TP9	31J
ODAJ	Navigation Display Unit	13T	13TP9	Δ26B	13T	13TP9	Δ26B
ODALAAA,ODALBAA	Main Computer, Cable Assembly	13T	13TP9	34Y	13T	13TP9	--
ODALC	Data Loader	13T	13TP9	34Y	13T	13TP9	--
ODALD	Interface Unit	13T	13TP9	34Y	13T	13TP9	--
OD6	Training Interface Unit, Imagery Simulator	13T	13TP9	--	13T	13TP9	--
OD7	Portable Data Entry Device	13T	13TP9	34Y	13T	13TP9	--

Δ Change from previous study.

Table C-1 (Continued)

LOGISTICS CONTROL NUMBER	EQUIPMENT NAME	REFERENCE			BASELINE		
		C	O	DS	C	O	DS
	END ITEM: LAUNCHER SUBSYSTEM						
GLV	Truck	13T	63B	63W	13T	63B	63W
				63G			63G
OBA	Air Vehicle Loader	13T	13TP9	63W	13T	13TP9	63W
OBB	Initializer Assembly, Hydraulics	13T	13TP9	26L	13T	13TP9	26L
OBC	Launcher Assembly	13T	13TP9	63W	13T	13TP9	63W
OBCAAAF	Launcher Control Panel, Power Supply	13T	13TP9	Δ 26B	13T	13TP9	Δ 26B
OBD	Launcher Command Module	13T	13TP9	Δ 26B	13T	13TP9	--
	END ITEM: MAINTENANCE SHELTER						
GMV	Truck	13T	63B	63W	13T	63B	63W
				63G			63G
OGAA	Shelter Assembly	13T	13TP9	44B	13T	13TP9	44B
OGAALAE	Power Monitor	13T	13TP9	Δ 26B	13T	13TP9	Δ 26B
OGAAN, OGP	Air Conditioner, Air Vehicle Cooling Assembly	13T	13TP9	52C	13T	13TP9	52C
OGQ	AV Fault Isolator	13T	13TP9	--	13T	13TP9	--
OGQA	Video Monitor	13T	13TP9	26T	13T	13TP9	--
OGQL, OGQM	Power Supply	13T	13TP9	Δ 26B	13T	13TP9	--
OGR	Nitrogen Purge Set	13T	13TP9	--	13T	13TP9	--
XWL1	Binoculars	13T	13TP9	41C	13T	13TP9	41C
XWL2	Radiac Changer	13TP9	13TP9	35H	13TP9	13TP9	35H
XWL4	Grenade Launcher M203	13T	13T	45B	13T	13T	45B
XWL5	Machine Gun	13T	13T	45B	13T	13T	45B
XWL6, XWL7	Multimeters	13TP9	13TP9	35H	13TP9	13TP9	35H
XWL3, XWL8, XWL9	Compass, Survey Set, Theodolite	13T	13TP9	41B	13T	13TP9	41B
XWL10	Electrical Tool Kits	13TP9	13TP9	31E	13TP9	13TP9	31E
	END ITEM: PRIME MOVER	13T	63B	63W	13T	63B	63W
GPV	Truck			63G			63G
	END ITEM: RECOVERY SUBSYSTEM						
GRV	Truck	13T	63B	63W	13T	63B	63W
				63G			63G
OCA, OCLA, OCAB	Recovery Assembly, Hydraulics, Crane Structure	13T	13TP9	63W	13T	13TP9	63W

Δ Change from previous study.

Table C-1 (Continued)

LOGISTICS CONTROL NUMBER	EQUIPMENT NAME	REFERENCE			BASELINE		
		C	O	DS	C	O	DS
OCB	Recovery Guidance Assembly	13T	13TP9	45G	13T	13TP9	Δ35E
	END ITEM: REMOTE GROUND TERMINAL						
GGT	Trailer	13T	63B	63W	13T	63B	63W
MGRGT	Generator Set 1.5 KW	Δ52D	Δ52D	52D	Δ52D	Δ52D	52D
MRGT	Antenna	13T	13TP9	26L	13T	13TP9	--
MRGT1	Remote Ground Terminal Electronics	13T	13TP9	26L	13T	13TP9	--

Δ Changes from previous study.

APPENDIX D
PERSONNEL REQUIREMENTS ANALYSIS

D.1 PERSONNEL FLOW RATES

This appendix includes the detailed results of the Personnel Requirements Analysis. The contents of Table D.1-1 are the personnel flow rates; (1) attrition; (2) promotion; and (3) trainees, transients, holdees and students (TTHS) overhead percentages. The variation of rates among MOSs and paygrades are a result of Career Management Field (CMF) structure differences, bonus levels, internal or external policy changes. The importance of measuring the foregoing rates is to estimate the quantities and qualities of personnel replacements needed to support present or future system specific manpower requirements.

D.2 INTERACTIVE MANPOWER-PERSONNEL ASSESSMENT AND CORRELATION TECHNOLOGY (IMPACT) MODEL RESULTS

Table D.2-1 contains the personnel requirements by MOS/paygrade for the baseline systems, 3/2 shift concept including Platoon Headquarters requirements. Similar information was prepared for the Sustained Tempo of operations. Personnel requirement structures will vary according to input rates and the level and quantity of manpower requirements within each MOS.

Table D.1-1. Personnel Flow Rates

MOS = 13T

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.518	1.311	0.
E-2	0.	0.360	1.757	0.050
E-3	406.0	0.266	0.907	0.046
E-4	168.0	0.363	0.269	0.048
E-5	112.0	0.243	0.241	0.030
E-6	112.0	0.146	0.151	0.027
E-7	70.0	0.164	0.149	0.

MOS = 13T P9

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.518	1.311	0.
E-2	0.	0.360	1.757	0.050
E-3	0.	0.266	0.907	0.046
E-4	56.0	0.363	0.269	0.048
E-5	56.0	0.243	0.241	0.030

MOS = 26B

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.260	1.603	0.
E-2	0.	0.160	1.699	0.070
E-3	0.	0.198	1.223	0.060
E-4	14.0	0.422	0.271	0.068

MOS = 26L

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.428	1.761	0.
E-2	0.	0.183	1.580	0.129
E-3	0.	0.159	1.113	0.129
E-4	0.	0.247	0.368	0.068
E-5	14.0	0.263	0.199	0.043

Table D.1-1 (Continued)

MOS = 31E

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.556	1.414	0.
E-2	0.	0.340	1.432	0.013
E-3	0.	0.182	1.045	0.121
E-4	14.0	0.327	0.359	0.062

MOS = 31J

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.430	1.726	0.
E-2	0.	0.237	1.632	0.088
E-3	0.	0.121	1.021	0.088
E-4	14.0	0.292	0.230	0.067

MOS = 31S

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.257	1.843	0.
E-2	0.	0.344	1.256	0.170
E-3	0.	0.204	1.067	0.169
E-4	14.0	0.367	0.470	0.110

MOS = 34Y

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.262	1.718	0.
E-2	0.	0.370	1.241	0.080
E-3	0.	0.249	1.080	0.078
E-4	0.	0.321	0.457	0.043
E-5	14.0	0.602	0.214	0.023

Table D.1-1 (Continued)

MOS = 35E

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.323	1.458	0.
E-2	0.	0.159	1.964	0.050
E-3	0.	0.178	1.048	0.048
E-4	0.	0.410	0.383	0.063
E-5	14.0	0.420	0.205	0.115

MOS = 35H

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.287	1.703	0.
E-2	0.	0.272	1.531	0.210
E-3	0.	0.215	1.067	0.201
E-4	0.	0.267	0.510	0.120
E-5	14.0	0.385	0.385	0.068

MOS = 36H

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.382	1.553	0.
E-2	0.	0.290	1.344	0.163
E-3	0.	0.161	1.025	0.163
E-4	14.0	0.247	0.386	0.115

MOS = 41B

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.474	1.263	0.
E-2	0.	0.226	2.264	0.050
E-3	0.	0.367	1.265	0.050
E-4	14.0	0.493	0.274	0.019

Table D.1-1 (Continued)

MOS = 41C

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.505	1.424	0.
E-2	0.	0.455	1.485	0.050
E-3	0.	0.192	0.927	0.042
E-4	14.0	0.374	0.297	0.043

MOS = 43M

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.605	1.538	0.
E-2	0.	0.361	1.783	0.041
E-3	0.	0.219	0.914	0.041
E-4	14.0	0.245	0.074	0.024

MOS = 44B

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.315	1.446	0.
E-2	0.	0.331	1.717	0.054
E-3	0.	0.243	1.043	0.043
E-4	0.	0.266	0.250	0.035
E-5	14.0	0.277	0.117	0.026

MOS = 45B

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.320	1.628	0.
E-2	0.	0.258	1.980	0.042
E-3	0.	0.143	1.058	0.032
E-4	14.0	0.184	0.179	0.052

Table D.1-1 (Continued)

MOS = 52C

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.388	1.323	0.
E-2	0.	0.294	1.917	0.051
E-3	0.	0.223	0.972	0.043
E-4	0.	0.404	0.087	0.031
E-5	14.0	0.199	0.084	.030

MOS = 52D

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.416	1.482	0.
E-2	0.	0.407	1.611	0.055
E-3	0.	0.281	0.999	0.045
E-4	14.0	0.542	0.200	0.037

*MOS = 52D

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.416	1.482	0.
E-2	0.	0.407	1.611	0.055
E-3	56.0	.281	0.999	0.045
E-4	56.0	0.542	0.200	0.037

MOS = 63G

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.338	1.514	0.
E-2	0.	0.372	1 666	0.055
E-3	0.	0.274	0.901	0.045
E-4	0.	0.527	0.263	0.048
E-5	14.0	0.341	0.206	0.

*Includes 52D Section Requirements

Table D.1-1 (Continued)

MOS = 63J

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.420	1.610	0.
E-2	0.	0.345	1.735	0.050
E-3	0.	0.256	0.942	0.040
E-4	14.0	0.270	0.133	0.033

MOS - 63W

PAYGRADE	MANPOWER	ATTRITION	UPGRADE	TTHS
E-1	0.	0.279	1.137	0.
E-2	0.	0.298	1.963	0.051
E-3	14.0	0.305	0.995	0.041
E-4	0.	0.432	0.261	0.039
E-5	14.0	0.437	0.174	0.

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Table D.2-1. Personnel Requirements Output

MOS = 13T RECRUITS PER YEAR = 837.4

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	457.8	0.	0.	837.4	0.	837.4
E-2	293.5	0.	0.	600.2	0.	600.2
E-3	424.7	406.0	424.7	498.2	498.1	0.0
E-4	609.5	168.0	176.1	385.2	111.3	273.9
E-5	338.7	112.0	115.4	163.9	55.8	108.1
E-6	274.9	112.0	115.0	81.6	34.2	47.5
E-7	132.6	70.0	70.0	41.5	21.9	19.6

MOS = 13T RECRUITS PER YEAR = 142.6

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	78.0	0.	0.	142.6	0.	142.6
E-2	48.3	0.	0.	102.2	0.	102.2
E-3	72.3	0.	0.	84.8	0.	84.8
E-4	103.8	56.0	58.7	65.6	37.1	28.5
E-5	57.7	56.0	57.7	27.9	27.9	0.0

MOS = 26B RECRUITS PER YEAR = 15.3

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	8.2	0.	0.	15.3	0.	15.3
E-2	7.1	0.	0.	13.2	0.	13.2
E-3	8.5	0.	0.	12.0	0.	12.0
E-4	15.0	14.0	15.0	10.4	10.4	0.0

MOS = 26L RECRUITS PER YEAR = 17.9

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	8.2	0.	0.	17.9	0.	17.9
E-2	8.2	0.	0.	14.4	0.	14.4
E-3	10.1	0.	0.	12.9	0.	12.9
E-4	18.3	0.	0.	11.3	0.	11.3
E-5	14.6	14.0	14.6	6.7	6.7	0.0

Table D.2-1 (Continued)

MOS = 31E   RECRUITS PER YEAR =   20.6

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	10.5	0.	0.	20.7	0.	20.7
E-2	8.4	0.	0.	14.8	0.	14.8
E-3	9.8	0.	0.	12.0	0.	12.0
E-4	14.9	14.0	14.9	10.2	10.2	0.0

MOS = 31J   RECRUITS PER YEAR =   12.5

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	5.8	0.	0.	12.5	0.	12.5
E-2	5.4	0.	0.	10.0	0.	10.0
E-3	7.6	0.	0.	8.7	0.	8.7
E-4	15.0	14.0	14.9	7.8	7.8	0.0

MOS = 31S   RECRUITS PER YEAR =   22.5

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	10.7	0.	0.	22.5	0.	22.5
E-2	12.3	0.	0.	19.7	0.	19.7
E-3	12.2	0.	0.	15.5	0.	15.5
E-4	15.5	14.0	15.5	13.0	13.0	0.0

MOS = 34Y   RECRUITS PER YEAR =   36.8

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	18.6	0.	0.	36.8	0.	36.8
E-2	19.8	0.	0.	31.9	0.	31.9
E-3	18.5	0.	0.	24.6	0.	24.6
E-4	25.7	0.	0.	20.0	0.	20.0
E-5	14.4	14.0	14.4	11.7	11.7	0.0

Table D.2-1 (Continued)

MOS = 35E RECRUITS PER YEAR = 31.2

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	17.5	0.	0.	31.2	0.	31.2
E-2	12.0	0.	0.	25.6	0.	25.6
E-3	19.3	0.	0.	23.6	0.	23.6
E-4	25.5	0.	0.	20.2	0.	20.2
E-5	15.6	14.0	15.6	9.8	9.8	0.0

MOS = 35H RECRUITS PER YEAR = 29.0

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	14.6	0.	0.	29.0	0.	29.0
E-2	13.8	0.	0.	24.8	0.	24.8
E-3	16.4	0.	0.	21.1	0.	21.1
E-4	22.6	0.	0.	17.5	0.	17.5
E-5	15.0	14.0	15.0	11.5	11.5	0.0

MOS = 36H RECRUITS PER YEAR = 17.3

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	9.0	0.	0.	17.3	0.	17.3
E-2	8.5	0.	0.	13.9	0.	13.9
E-3	9.6	0.	0.	11.4	0.	11.4
E-4	15.6	14.0	15.6	9.9	9.9	0.0

MOS = 41B RECRUITS PER YEAR = 21.3

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	12.3	0.	0.	21.4	0.	21.4
E-2	6.2	0.	0.	15.5	0.	15.5
E-3	8.7	0.	0.	14.1	0.	14.1
E-4	14.3	14.0	14.3	10.9	10.9	0.0

Table D.2-1 (Continued)

MOS = 41C RECRUITS PER YEAR = 20.9

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	10.9	0.	0.	20.9	0.	20.9
E-2	8.0	0.	0.	15.5	0.	15.5
E-3	10.6	0.	0.	11.8	0.	11.8
E-4	14.6	14.0	14.6	9.8	9.8	0.0

MOS = 43M RECRUITS PER YEAR = 9.5

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	4.4	0.	0.	9.5	0.	9.5
E-2	3.2	0.	0.	6.8	0.	6.8
E-3	5.0	0.	0.	5.7	0.	5.7
E-4	14.3	14.0	14.3	4.6	4.6	0.0

MOS = 44R RECRUITS PER YEAR = 20.9

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	11.9	0.	0.	20.9	0.	20.9
E-2	8.4	0.	0.	17.2	0.	17.2
E-3	11.2	0.	0.	14.4	0.	14.4
E-4	22.6	0.	0.	11.7	0.	11.7

MOS = 45B RECRUITS PER YEAR = 8.2

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	4.2	0.	0.	8.2	0.	8.2
E-2	3.1	0.	0.	6.9	0.	6.9
E-3	5.1	0.	0.	6.1	0	6.1
E-4	14.7	14.0	14.7	5.4	5.	0.0

Table D.2-1 (Continued)

MOS = 52C   RECRUITS PER YEAR = 42.2

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	24.7	0.	0.	42.2	0.	42.2
E-2	14.8	0.	0.	32.7	0.	32.7
E-3	23.7	0.	0.	28.3	0.	28.3
E-4	46.9	0.	0.	23.0	0.	23.0
E-5	14.4	14.0	14.4	4.1	4.1	0.0

MOS = 52D   RECRUITS PER YEAR = 22.1

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	11.7	0.	0.	22.1	0.	22.1
E-2	8.6	0.	0.	17.3	0.	17.3
E-3	10.8	0.	0.	13.8	0.	13.8
E-4	14.5	14.0	14.5	10.8	10.8	0.0

*MOS = 52D   RECRUITS PER YEAR = 120.1

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	63.3	0.	0.	120.2	0.	120.2
E-2	46.5	0.	0.	93.8	0.	93.8
E-3	58.5	56.0	58.5	74.9	74.9	0.0
E-4	78.8	56.0	58.1	58.5	43.1	15.4

MOS = 63G   RECRUITS PER YEAR = 44.9

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	24.2	0.	0.	44.9	0.	44.9
E-2	18.0	0.	0.	36.7	0.	36.7
E-3	25.5	0.	0.	30.0	0.	30.0
E-4	29.1	0.	0.	23.0	0.	23.0
E-5	14.0	14.0	14.0	7.7	7.7	0.0

*52D Section Requirements

Table D.2-1 (Continued)

MOS = 63J RECRUITS PER YEAR = 11.2

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	5.5	0.	0.	11.2	0.	11.2
E-2	4.3	0.	0.	8.9	0.	8.9
E-3	6.2	0.	0.	7.4	0.	7.4
E-4	14 5	14.0	14.5	5.8	5.8	0.0

MOS = 63W RECRUITS PER YEAR = 42.5

PAYGRADE	PERSONNEL REQUIREMENTS	UNADJUSTED MANPOWER	TTHS ADJUSTED MANPOWER	PERSONNEL TO BE TRAINED PER YR	MANPOWER LOSSES PER YR	OVERHEAD LOSSES PER YR
E-1	30.1	0.	0.	42.6	0.	42.6
E-2	15.1	0.	0.	34.2	0.	34.2
E-3	22.8	14.0	14.6	29.7	18.9	10.7
E-4	32.8	0.	0.	22.7	0.	22.7
E-5	14.0	14.0	14.0	8.6	8.6	0.0